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# East Europe Report

## SCIENTIFIC AFFAIRS

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ACCOMPLISHMENTS OF EMINENT PHYSICIST OUTLINED

Sofia NARODNA KULTURA in Bulgarian 23 Apr 82 p 2

[Article by Prof Dr N. Martinov, Docent, Candidate of Physical Sciences Iv. Lalov, Docent, Candidate of Physical Sciences Kr. Germanov, and Senior Science Associate and Candidate of Physical Sciences A. Konova, instructors on the Chair for Solid State Physics under the Kl. Okhridski Sofia University: "An Inspired Scientist and Citizen"]

[Text] Corresponding Member [of the Bulgarian Academy of Sciences], Prof Milko Borisov is one of the founders of solid state physics in Bulgaria. He is the creator of a scientific school of acoustical electronics and acoustical optics in Bulgaria. This is a new and rapidly developing area which involves important areas of modern physics and engineering including microelectronics, microwave acoustics and integrated optics. The comprehensive and profound research of Prof M. Borisov are of important fundamental and applied significance. His contributions and pioneering have been repeatedly praised highly by prominent scientists in the USSR, the United States, the GDR, FRG and England.

The works for which Prof M. Borisov has been proposed for the Dimitrov Prize are two peak achievements in the Bulgarian school of acoustical electronics. The first work relates to the observance of a new phenomenon in acoustical electronics. In interacting with electron fluxes, the waves of flexure ["oguvane"] in monocrystal wafers are amplified. On the basis of this phenomenon, new types of resonance transistors have been experimentally studied and developed and they satisfy the requirements of microelectronics. This work is based on new methods of measuring small mechanical oscillations successfully realized in the present research of Prof M. Borisov and his co-workers. The second work shows the possibility of employing quartz piezoelectric resonators for frequency metering with maximum high accuracy. This makes it possible to measure the physical amounts with very great sensitivity. The new laser velocity meter proposed by the co-workers of Prof M. Borisov is based on this principle. This work establishes the beginning of a new area in instrument building.

All the work of Prof M. Borisov shows an important essential trait in his scientific creativity, that is, the scientific achievements should be introduced into practice! He is profoundly convinced that science has true value and strength only if it is directly linked to the needs of life and society. This view has been the driving force in the active career of the scientist and his criterion for evaluation and

self-evaluation. He instills this profound civil feeling in his students and co-workers.

The biography of Prof M. Borisov would not be complete if mention were not made of other aspects of his activities. He has done enormous work in the area of physics education and he has been the inspirer and instituter of modernizing the physics course in the secondary schools, the indoctrinator and leader of the young scientific personnel on the Physics Faculty of Sofia University and the creator of the specialization [major] in solid state physics. Prof M. Borisov is the director of the Unified Physics Center and the Institute for Solid State Physics under the Bulgarian Academy of Sciences, the leader of national programs and the creator of the international school for condensed-state physics operating permanently in Bulgaria.

By any criteria the scientific activities of Prof M. Borisov merit the Dimitrov Prize, which is high social recognition for the scientific achievements and total dedication of this talented scientist and citizen.

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CSO: 2202/11

## DEVELOPMENT OF COMPUTER SYSTEMS REVIEWED

### Estel Teleprocessor Family

Sofia TEKHNICHESKO DELO in Bulgarian 24 Apr 82 pp 1, 4

[Article by Engr Yulian Danchev: "The Estel Family"]

[Text] The aim of the Estel Project was to develop, introduce and produce systems for teleprocessing and a multimachine network. It was developed by the following collective: Senior Science Associate Zhivko Zhelezov, leader, Senior Science Associate Venko Markov, Senior Science Associate Ilich Yulzarn, Engr Nedko Zhelevski, Senior Science Associate Stoyan Markov, Engr Venelin Altunov, Engr Svetla Basmadzhieva and Senior Science Associate Koycho Vitanov.

If the thesis is correct that the importance of a scientific achievement must be judged primarily from the benefit that it brings society, undoubtedly the developers of the Estel Teleprocessing System have rightly been submitted as candidates for the 1982 Dimitrov Prize. The success of their many years of work has many ramifications, the most important of which is the economic effect. A special plant has been created for producing the Estel and its products are exported without competition to many nations. Up to now over 200 systems have been sold in the USSR alone. They are evermore widely being employed in our electronic computer centers and systems for production and management automation in order to greatly expand their capability for flexibility, efficiency and coverage.

The idea of the Estel arose when it became clear that the future belonged to computers operating on real time. Only with their aid would it be possible to realize automated control systems for production processes where the information on the object's current state had to immediately cause a control action. This meant first of all that man had to be excluded from the collecting and inputting of the data. As a result the purely technical problem arose of the dependable and rapid transfer of information from the place it arose to the computer complexes as well as the reverse transmission of the control action to the servomechanisms. With the present form of industrial production (both in technical and managerial terms), the components of the individual production systems and subsystems, as a rule, are scattered over great distances. This excludes the possibility of directly utilizing the simple and widespread telephone and telegraph lines for transmitting the data to the computers and back. As a result, the necessity arises of equipment and hardware which can "mediate" between the computers and the distant data sources such as

pick-ups, telexes and so forth. There thus arose the first modifications of the Estel which made it possible to connect a large number of remote terminals to the computer installations over the switchable and nonswitchable telephone and telegraph lines, thus eliminating the harmful influence of distance. This was a great accomplishment, although, as we will see, it subsequently turned out that it would have been better to solve the reverse problem, that is, the computers should have been spread out and brought closer to the data sources. In order to do this it would have been necessary to develop new technical capabilities and program components which at the time of Estel-2 were unknown. However the case, precisely the modifications Estel-2 and Estel-2.1 were vitally essential, rationally and effectively usable and thus became widespread. Their basic configuration included the ES-8401 multiprocessor which was developed in order to make it possible to connect all the models of computers of the Unified Series (ES-1022, 1030, 1033, 1040 and 1050) with all types of terminals of the ES-8501 type as well as with the telex equipment produced in the GDR and CSSR, the Hungarian video displays and so forth. The basic unit in the system is the data sets [modems] developed and produced in a range covering virtually all possible speeds which are employed in data transmission.

The software of the system is of particularly important significance for all the Estel modifications. In addition to providing its complete compatibility with all equipment of the Unified Series (adopted by the CEMA countries), precisely the software gives the system that universal applicability which makes it equally suitable at industrial enterprises as well as in rail, motor and air transport, both in the ministries as well as institutions of higher learning, hospitals and so forth. The software is based on products such as the base telecommunications access method (BTAM), the telecommunication sequential access method (KTAM) and the dialogue terminal system (DTS). We must specially mention the data flow control system (SUIP) which, although being developed for other purposes, makes it possible to use the branched terminal network of Estel for operating on real time. It must be realized that Estel owes its great functional capabilities and universality precisely to the first-rate software developed for it by the developers.

At the same time the requirements of modern production processes for ever-greater speed and accuracy have grown quickly and this has raised the issue of full automation as an urgent necessity in all spheres. This has meant (aside from all else) the encompassing of evermore production and management equipment in widely branched and complicated automated systems. In this new situation the principle of centralized data processing has begun to become ineffective. The increase in the data flows and their density logically leads to a decline in the speed of the automated system and this in and of itself contradicts the very reasons for its development. The central computer had to be freed and for this new hardware and software were needed by which the computer resources could be dispersed over the entire territory encompassed by the automated system. Moreover, the necessity arose of connecting the individual automated systems and particularly their dispersed computer equipment into automated installations of a higher order. Thus, two important problems would be solved: the effective and direct redistribution of the computer resources from the viewpoint of their optimum load factor and the automated exchange of data between systems which was particularly important with hierarchical structures.

The practical realization of such a concept was fundamentally impossible without a corresponding teleprocessing system and this meant a new Estel created from

telecommunication processors and intelligent terminals. The developers of Estel must be congratulated as they responded promptly to the new demands and as a result of this Estel-4.1 appeared. This already was an installation for remote data transmission and processing which applied new operating principles, new hardware and improved hardware and software diagnosis. The structure and organization of Estel-4.1 is based upon the concept and architecture of network teleprocessing in which local computer capability predominates. As a result the system has a number of advantages which are expressed in increased speed, effective use of communications lines and the freeing of the central computer.

Of particular importance for the actual use and rapid spread of Estel-4.1 is its capacity to emulate all the functions of Estel-2 and Estel-2.1 without making any changes in the organization of the hardware. The developers of Estel-4.1 have correctly understood the great economic significance of emulating (encompassing) the old system's functions by the new one because with the use of a large number of the previous modifications of Estel, the expanding of the automated systems of which they were a part and particularly the converting of them into computer networks would mean the large-scale abandoning of usable and expensive equipment. In truth, in the emulation mode, the Estel-4.1 does not employ all its computer and functional power but the benefit from maintaining the status quo is very great. In this regard the accomplishment of the collective which created the capacity for emulation must be particularly pointed out. In practice this mode is realized by carrying out the emulation program by the ES-8371 telecommunication processor which in turn is a basic part of the system.

Also characteristic for the hardware of Estel-4.1 is the availability of a number of new technical devices. In addition to the telecommunication processor (photo 1 [not reproduced]), the system includes an IZOT-7925 video terminal (photo 2), a SM-1604 video terminal (photo 3), a SM-1605 miniterminal (photo 4) and others. It is equipped with a developed system of program diagnostics and with on-line tests which operate under the control of the operational testing system (SOT) and the internal functional test (VFT) for all units. In addition, the control program of the telecommunication processor includes software for the dynamic testing of the communications lines during operating time.

In conclusion it can be said that the Estel-4.1 is a talented and enormously practical interpretation of the moden notion of realizing computer processes through computer networks and multimachine systems. Along with the previous modifications of Estel, they represent a substantial contribution to the development of Bulgarian computer equipment and particularly to increasing the effectiveness of its use in automated control systems. Equally important, the appearance of Estel substantially broadens the export capabilities of the nation in an area where Bulgaria has already indisputed authority. This has been the result of creative persons among whom a worthy place is held by the developers of Estel.

## Data Preparation Units, Systems

Sofia TEKHNICHESKO DELO in Bulgarian 24 Apr 82 pp 1, 5

[Article by Engr Aleksandur Kostov: "Data Preparation Units and Systems"]

[Text] The aim of the project was to develop, introduce and produce a family of data preparation units and systems for electronic computers. The developers

included: Senior Science Associate and Candidate of Technical Sciences Tikhomir Topalov (leader), Engr Leon Mairov, Engr Vitko Elenkov, Engr Aleksi Aleksiev, Engr Branimir Buyukliev, Engr Lilyana Taneva, Candidate of Technical Sciences, Engr Atanas Mikhaylov and Engr Vladimir Chervenakov.

Many call our age the electronic age, in pointing to one of its offspring, the electronic computer. It would truly be difficult to imagine today (and even more tomorrow) without it. It would also be difficult to mention any other area of science and technology where achievements are so quickly out of date. The designers have merely to "neglect" one of its numerous devices to turn this into a weak point of the entire system. At the end of the 1960's, the problem arose of preparing the data which would be processed by computer. At present, no one in the world underestimates it. Statistics show that over 50 percent of the expenditures in operating a computer go for preliminary processing of the primary data and this percentage has been constantly increasing. During the last decade in our Institute for Computer Engineering under the leadership of Senior Science Associate, Candidate of Technical Sciences Tikhomir Topalov, a family of data preparation units and systems has been developed. The 14 inventions embodied in them show their high technical level. The importance of this fact is reinforced by the circumstance that when we began to design the units the nation did not have any experience whatsoever in developing data preparation equipment.

In essence everything started by a trip abroad. We got a feeling, as is said, for the direction in which the wind was blowing and quickly the research was brought into line with modern trends. The aim was obvious: to develop devices with magnetic carriers (tape and discs) which would replace the unproductive punch-card equipment which no longer met the requirements. The first Bulgarian unit for preparing data on magnetic tape, the ES-9002, was developed in a record short time. In 1972, this was completed and it went into regular production the following year. Significant numbers of this unit were exported to the USSR, Hungary, India, Yugoslavia and elsewhere. It also received a number of awards: gold medals at the fairs in Plovdiv (1973) and Brno (1974), the diploma and gold emblem of the national review of the TNTM [Movement for Youth Technical and Scientific Creativity] (1974) and the diploma of the DKNTP [?State Committee for Scientific and Technical Progress] (for its modification the ES-9002.02 in 1977). The unit was marked by original approaches which put it above its Western competitors, including: the control of the tape drive mechanism and keyboard, the timer, the layout of the keyboard, size, weight and so forth. It embodied five inventions. In 1977, a commission of experts from several nations gave it a higher evaluation than an analogous U.S.-produced product. Over the years, the unit has been developed and the first modification appeared, the ES-9002.01 (in addition it had the "data unification" function), and subsequently a second modification, the ES-9002.02 (with one other "data print" function). But the decisive modernization came later when on the basis of the ES-9002 the ES-9004 was developed. As the specialists say, the basic difference is in its increased intelligence. The new unit which also employed a magnetic tape was ready in 1980. During the same year, it went into regular production. An international commission again noted its better parameters in comparison with its American competitors. In the unit a number of the designs are protected by certificates of invention. The modifications, the ES-9004.01, the ES-9004.02, the ES-9004.03 (photo 1 [not reproduced]) and the ES-9004.04, widen its functional capabilities and hence its area of application.

At the same time, needs have suggested another area of work, the multiconsole data preparation systems which are effective in instances when many individual units of the ES-9002 or ES-9004 type are needed. Thus, in 1977, the ES-9003 system was developed (photo 2) and this is a problem-oriented computer installation which includes a miniprocessor, monitors and peripheral units. The data are input through 16 video keyboard consoles, they are stored in a minidisc memory and after processing are fed onto magnetic tape or are printed out. The system has been in regular production since 1978. During the same year it received a gold medal at the Plovdiv Fair and in the following year a silver medal at the Moscow Exhibit "Computer Equipment of the Socialist Countries." In 1979, a variation of the system was developed with a telecommunication adapter and this made it possible to transmit the data directly to the central computer. In 1980, the ES-9003 was incorporated as part of the Estel-4.1 teleprocessing system as a synchronous terminal station.

The ES-9005 represents the further development of multiconsole systems and this unit realizes the modern concepts of decentralized data preparation. In it there are 32 consoles for inputting the data. State testing of the system has been successfully concluded and it has been put into production.

Simultaneously with the development of magnetic-tape data preparation units, units have been developed which operate on a floppy magnetic disc. This is the ES-9112 which was designed on the basis of the SM-600 microprocessor family. This is one of the first units in Bulgaria which has been developed on the basis of large integrated circuits. Its international testing has been successfully concluded. Its continuation has been the ES-9113 which has the possibility of re-recording information from a floppy magnetic disc back onto magnetic tape and vice versa. The unit embodies two inventions. A trial series was manufactured in 1980.

The ES-9114 (photo 3) "succeeded" the ES-9002 and the ES-9004, but the carrier is a floppy magnetic disc. It was completed in 1981, in the same year it successfully underwent international testing and at present is beginning regular production. Three inventions are embodied in it.

If one must make a final reckoning, the following advantages of the new data preparation units and systems will become apparent: an enormous amount of paper, machine time and equipment is saved. For example, the ES-9002 replaces a key punch, a monitor and a punch-card reader. Something very important is that the productivity using the units of the family averages 60-140 percent higher than the key punches. Operating expenses are less while reliability is substantially increased. The high technical level of the developments has made it possible for our nation to hold leading positions in this area among the socialist nations and throughout the world.

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CSO: 2202/10

# PRECIOUS METALS CONSERVATION IN ELECTRONICS, ELECTRICAL INDUSTRIES DESCRIBED

Prague SDELOVACI TECHNIKA in Czech No 2, 1982 pp 41-44

[Article by Eng Hana Simanova: "The Designers' Task in Thrifty Use of Precious Metals in Electrical Engineering and Electronics"]

[Text] Thrifty use of metals is currently a top-priority national economic task. Accordingly, one of the state special purpose programs for the Seventh Five-Year Plan is a program for increasing the efficiency of metal consumption (SCP-RSK-03), which deals with the task in a comprehensive manner by including the metal processing sector within its scope. Long-term analysis indicates that design work unquestionably plays the critical role in decreasing materials requirements in the production cycle. The importance of this work and the irreplaceable role of designers and manufacturing engineers also found an echo at the 16th CPCZ Congress.

The design which a designer selects determines not only the technical characteristics of the future product or piece of equipment, but also metal consumption per unit, which is now of especial importance to us. Accordingly, the following reflections, focusing primarily on precious metals (specifically gold and silver) are directed chiefly at designers and manufacturing engineers in the electrical engineering and electronics industries.

In the last century precious metals and their alloys were used almost exclusively for decorative purposes. As industrial production developed and science and technology progressed, however, they have become an increasingly important modern industrial materials, which accounts for the increase in their use. For example, 95 percent of the silver and 58 percent of the gold (i.e., the bulk of total annual consumption) processed in Czechoslovakia are used for technical purposes. Most of this metal is used in electrical engineering, where the special physical and chemical properties of silver and gold make them indispensable to the industry's current level of technical development.

## The Uses of Silver in Electrical Engineering and Electronics

Its suitable physical and chemical properties and its more favorable price in comparison with other precious metals result in an increasing use of silver, particularly in the production of electrical contacts and functional

coatings for a great variety of parts and assemblies in electrical engineering and electronics, and as an alloy addition in the production of solders.

## Silver Electrical Contacts

Electrical switching component (contacts), which are an essential part of almost all electrical devices and equipment, are subject to increasingly stringent requirements as regards their reliability and durability. These requirements, combined with the suitable properties of silver, make it, its alloys and its sintering products essential components of electrical contacts. Naturally, then, ever-increasing amounts of silver are being used. But the shortage of raw materials and particularly the steady rise in the price of silver are forcing contact material producers and users to decrease silver consumption per item in order to make maximum use of the metal.

We may cite the following possibilities for conserving silver as a contact material.

The use of plated materials (by "plated material" we mean a material consisting of two layers of different metals joined by hot or cold rolling). In recent years the Safina National Enterprise in Vestec, in cooperation with VUK [Metallurgical Research Institute] in Panenske Brezany has been able to introduce industrial plating of base metals with silver or its alloys. In the case of contact materials the objective is to replace most of the nonfunctional section of the material with a base metal (largely copper or its alloys). Another advantage is the fact that use of plated materials also makes it possible to take advantage of the more suitable mechanical properties of the substrate materials, which often are superior to those of the contact materials. At present the Safina Vestec National Enterprise, the sole producer of precious metal semifinished products, is producing the items noted in Tables 1a-1e. An example of the use of plated materials is the plated contacts in relay switch circuits. Before this technology was introduced, the contacts were all-silver, but the substitution of plated materials decreased silver consumption by about 70 percent. Fig. 1b is a diagram of a plated contact. The quality, durability and functional capabilities of the design are equivalent to those of the earlier design.

[Tables and keys on following pages]

| Základní materiál a | ČSN b | Naplátovaný materiál c | ČSN b | Rozměry d | |
|---|---|---|---|---|---|
| Cu99,9 | 42 3001 | Ag ryzí e | 42 3830 | šíře pásů max. 110 mm, ≠ pásů 3—0,2 mm, ≠ naplátované vrstvy 1—0,1 mm | f |
| Ms90 | 42 3201 | AgNi 0,14 | — | šíře pásů max. 90 mm, ≠ pásů 3—0,2 mm, | g |
| Ms80 | 42 3203 | Ag ryzí | 42 3830 | ≠ naplátované vrstvy 1—0,1 mm | |
| Cu99,9 | 42 3001 | AgPd30 | 42 3838 | šíře pásů max. 60 mm, ≠ pásů 2—0,20 mm, | h |
| Ms90 | 42 3201 | Ag90Cu | 42 3834 | ≠ naplátované vrstvy 1—0,1 mm | |
| Ms80 | 42 3203 | | | | |
| CuSn6 | 42 3016 | Ag ryzí<br>AgNi 0,14 | 42 3830 | šíře pásu max. 50 mm, ≠ pásů 3—0,20 mm, ≠ naplátované vrstvy 1—0,1 mm | i |

Table 1a. Strips fully plated on one or both sides

Key:
a. Base material
b. Czechoslovak State Standard
c. Plating material
d. Dimensions
e. Pure Ag
f. Maximum strip width 110 mm, strip thickness 3-0.2 mm, thickness of plated layer 1-0.1 mm
g. Maximum strip width 90 mm, thickness of strip 3-0.2 mm, thickness of plated layer 1-0.1 mm
h. Maximum strip width 60 mm, thickness of strip 2-0.20 mm, thickness of plated layer 1-0.1 mm
i. Maximum strip width 50 mm, strip thickness 3-0.20 mm, thickness of plated layer 1-0.1 mm

| Základní materiál a | ČSN b | Naplátovaný materiál c | ČSN b | Rozměry d |
|---|---|---|---|---|
| Cu99,9 | 42 3001 | AuNi5 | 42 3803 | šíře pásů e 56 mm |
| CuSn6 | 42 3016 | AuAgNi3 | — | šíře plát. vrstvy f 14,5 mm |
| Ms90 | 42 3201 | | | ≠ pásů g 0,20 mm |
| Ms80 | 42 3203 | | | ≠ plát. vrstvy h 0,05 mm |

Table 1b. Strips plated on one side

Key:
a. Base material
b. Czechoslovak State Standard
c. Plating material
d. Dimensions
e. Strip width
f. Width of plated layer
g. Thickness of strip
h. Thickness of plated layer

| Základní materiál a | ČSN b | Naplátovaný materiál c | ČSN b |
|---|---|---|---|
| Ms70 | 42 3210 | d Ag ryzí 99,9 | 42 3830 |
| Ms68 | 42 3212 | AgNi0,14 | — |
| Ms63 | 42 3213 | Ag96,5Cu | — |
| MsNi14 | 42 3256 | AgPd30 | 42 3838 |
| CuSn6 | 42 3016 | | |

Table 1c. Strips with plated bars above the level of the base material ("Toplay")

Key:
a. Base material
b. Czechoslovak State Standard
c. Plating material
d. 99.9% pure Ag

| Základní materiál a | ČSN b | Naplátovaný materiál c | ČSN b | Rozměry d | |
|---|---|---|---|---|---|
| Cu99,9 | 42 3001 | eAg ryzí 99,9<br>Ag90Cu<br>AgNi 0,14<br>AgPd30 | 42 3830<br>42 3834<br>—<br>42 3838 | šíře pásů max. 110 mm, šíře 1 inlaye 50—5 mm, ≠ pásů 2—0,2 mm, ≠ inlaye 1—0,01 mm | f |
| Ms90<br>Ms80 | 42 3201<br>42 3202 | eAg ryzí 99,9<br>Ag90Cu<br>AgNi 0,14<br>AgPd30 | 42 3830<br>42 3834<br>—<br>42 3838 | šíře pásů max. 90 mm, šíře 1 inlaye 50—5 mm, ≠ pásů 2—0,2 mm, ≠ inlaye 1—0,01 mm | g |

h Maximální počet pruhů: 5 do celkové šíře 50 mm

Table 1d. Strips with bars inlaid into the base material ("Inlay")

Key: a. Base material
b. Czechoslovak State Standard
c. Plated Material
d. Dimensions
e. 99.9% pure Ag
f. Maximum strip width 110 mm, width of one inlay 50-5 mm, thickness of strip 2-0.2 mm, thickness of inlay 1-0.01 mm
g. Maximum strip width 90 mm, width of one inlay 50-5 mm, thickness of strip 2-0.2 mm, thickness of inlay 1-0.01 mm
h. Maximum number of bars 5, total width up to 50 mm

| Jádro a | ČSN b | Plášť c | ČSN b | d |
|---|---|---|---|---|
| Ag 99,9 | 42 3830 | AgPd30 | 42 3838 | ⌀ drátu 0,50—0,60 mm<br>tloušťka stěny 0,05 ± 0,03 mm |

Table 1e. Plated wires

Key: a. Core
b. Czechoslovak State Standard
c. Plated layer
d. Wire diameter 0.50-0.60 mm, wall thickness 0.05±0.03 mm

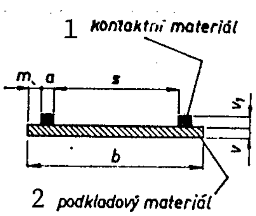


Fig. 1a. Figure to accompany Table 1c.

Dimensions: a, 1-4 mm; b, 4-90 mm; $v_1$, maximum 0.6 mm; v, 0.4-1.5 mm, m, minimum 1 mm; s, minimum 6 mm

Key: 1. Contact material
2. Substrate material

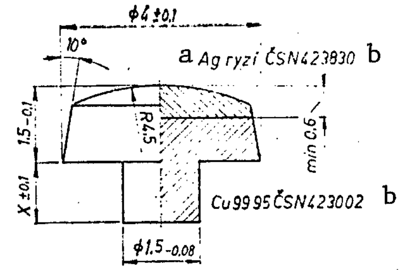


Fig. 1b. Plated contact

Key: a. Pure silver
b. Czechoslovak State Standard

Miniaturization of contacts and optimization of their form is another logical way of saving silver. The designers must attempt to design contacts of a shape which uses no excess contact material. For example, SEZ [Slovak Electrical Equipment Plants] Krompachy has replaced square contacts with round ones, saving several million korunas worth of silver.

New contact materials. Yet another possible means of conservation is more rapid development and introduction into production of new contact alloys and sinters with a lower precious-metal content but the same quality. An example is a sinter based on AgCdO, in which the presence of finely-dispersed CdO decreases contact wear. Also very promising is the $AgSn_2$ system, which can save up to 30 percent on silver.

Silver Coatings

There are many techniques for producing silver coatings on metals and dielectrics. The most widely used is electrochemical deposition of a silver or silver-alloy coating on a metal substrate, generally in order to increase its electrical conductivity.

There are several ways of making better and more efficient use of silver on electroplating, including the following.

Suitable choice of and adherence to thickness specifications. Coating thickness specifications must be based on a good knowledge of the properties of the plating material, the requirements applying to the part in question, the required durability and reliability, and the conditions under which the part will operate. Since choice of thickness is affected by several different, variable factors, the correct choice should be based on technical and economic analysis which stringently adheres to the aim of efficient use of silver. TESLA standard NT 1501 provides guidance for the choice of silver coating thicknesses in terms of location categories, i.e. extent of corrosive load.

Producibility of designs. Since the age of the "jack of all trades" has passed, close cooperation between the designer and surface treatment engineer, particularly at the initial design concept stage, should become a regular practice. While it is the custom for designers to consult with manufacturing engineers on the best machining shapes, this is not the case in the production of metal coatings, where the producibility of the design plays an important role in the plating process. It should be borne in mind

that if a component's shape is not suitable for plating, the plating process cannot be expected to be of high quality and cost-effective. But in some cases we fail to avoid pieces of complex shape. A typical example is the silver-coating of the inner surfaces of waveguide components, where the use of interior anodes is essential for high-quality, economical plating. On the basis of experimental measurements, TESLA Hloubetin has developed a simple procedure for determining the size and dimensions of anodes required for silver-coating the inner surfaces of conduits with a maximum length of 1200 mm and a minimum diameter of 20 mm.

Replacement of silver coatings by base metal coatings. In some cases silver-coating is continued only out of tradition with no technical justification. A typical example is the practice, common until recently in some organizations, of silver-coating to improve the solderability of parts or connections (soldering lugs, rivets). In most cases the requirement for a permanent joint can be fully met by substituting tin-plating.

Choice of the right type of silver-plating electrolyte. The critical factor in choosing the right type of bath is the required properties of the plated surface, particularly electrical conductivity, hardness, wear resistance, reflectivity and the like. On the basis of these considerations we classify silver electrolytes as those which produce a coating of pure silver (bright or matte finish) and those which produce alloy surfaces in which some silver is replaced by base metal.

An electrolyte with the trade name Syngal 710 (produced by BAL [expansion unknown] Uhrineves is commercially available in Czechoslovakia for the plating of matte pure silver surfaces; bright pure silver coatings are plated primarily with imported electrolytes. For example, TESLA's enterprises have had good results with the electrolyte designated R105 (produced by Riedel). The domestic electrolyte Syngal 720 is the primary one used in Czechoslovakia to produce alloy coatings. This produces coatings containing antimony (1 to 3 percent), which may be applied in any case where high wear resistance is required, but it must be borne in mind that the antimony decreases electrical conductivity.

Choice of suitable corrosion protection for silver. Suitable corrosion protection of silver against corrosion (blackening) does not, of course, result in conservation in absolute terms, but the correct choice of corrosion protection can increase the durability of the plated products, thus indirectly saving silver. A number of techniques to prevent blackening are in use. Almost the only way of assuring permanent corrosion resistance while maintaining good conductivity is the application of a layer of a more precious metal, e.g. gold, palladium or rhodium, 0.1 to 1 micron thick; if we also wish to assure good-quality soldered junctions, application of a layer of gold is most suitable.

Application of silver coatings only at functional locations. Recently the technology of partial (local) selective silver-coating has come into use in the production of silver coatings. The principle is that locations which do

not require a coating, i.e. nonfunctional locations, are covered by a mask (varnish or a mechanical mask) and so that the electrolyte comes in contact only with the exposed parts of the item to be coated.

### Silver-Containing Solders

Another aspect of the use of silver in the electrical industries is silver solders, whose sole producer in Czechoslovakia is Safina Vestec. The silver content of these solders ranges from 15 to 85 percent by weight. The great strength and generally good deformation properties of the joints, their corrosion resistance, excellent thermal and electrical conductivity, good wettability during soldering and relatively low operating temperatures have won them extensive use in electrical engineering. Here too there is potential for thrifty use of silver, including use of the following methods:

a. suitable treatment of the pieces to be joined,
b. soldering conditions,
c. replacement of high-silver solders by low-silver solders or use of base-metal solders.

Table 2 presents general information on silver-containing solders, which should be given particular attention in order to make efficient use of precious metals. [Table 2 and key are shown on the following page.]

### Use of Gold and Its Alloys in Electronics and Possibilities of Decreasing Gold Consumption

The microelectronics industry is the main consumer of gold in the electrical field. The sharp increase in output in this sector has resulted in increased consumption of gold, which to date has been irreplaceable in many aspects of the design of microelectronic components.

In designing microelectronic components it must be borne in mind that the gold cannot be recovered after the components are worn out because it is dispersed in minute quantities among huge numbers of parts or assemblies, so that recovery would be time-consuming and difficult. A more effective approach is to find and use designs and processes minimizing the use of gold.

### Functional Gold Coatings

About 85 percent of all of the goal consumed by the electronics industry is used for functional surfaces, mostly electrochemically produced. These include integrated circuit strip elements, transistor pins and planar connectors. A variety of requirements apply to gold coatings, ranging from the plating of ultrapure, surfaces with good solderability and contact quality and high temperature resistance to the production of surfaces with maximum wear resistance and minimum contact resistance.

Table 2. Solders with low precious-metal content

| Pájka a | Chemické složení b | | | | Interval tavení °C c | Pracovní teplota °C d | Mechanické vlastnosti spoje e | | | | Běžně dodávaný tvar j |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | základní materiál ČSN 42 3005 f | | základní materiál ČSN 17 246 g | | |
| | Ag | Cu | Zn | Cd | | | pevnost v tahu N/mm² h | pevnost ve střihu N/mm i | pevnost v tahu N/mm² h | pevnost ve střihu N/mm² i | rozměry v mm j |
| PAg15CuP | 15 | 80 | P 5 | — | 700—635 | 710—800 | 160—220 | 110—160 | — | — | pásy k 0,2 × 10 a 100<br>pruhy l 1 × 10 × 500 |
| PAg40CuZnCd | 40 | 19 | 21 | 20 | 630—595 | 640—680 | 170—220 | 70—120 | 320—370 | 100—160 | pásy 0,4 × 10 a 100 k<br>tyče tvář. ⌀ 2,0 × 1000 m<br>dráty ⌀ 1,6 a 2,0 n |

Key:
- a. Solder
- b. Chemical composition
- c. Melting range, °C
- d. Working temperature, °C
- e. Mechanical properties of joint
- f. Base material, Czechoslovak State Standard 42 3005
- g. Base material, Czechoslovak State Standard 17 246
- h. Tensile strength, $N/mm^2$
- i. Shear strength, N/mm
- j. Form in which usually sold: dimension in mm
- k. Strips
- l. Bars
- m. Rods 2.0 mm diameter x 1,000 mm
- n. Wire 1.6 and 2.0 mm diameter

PAg15CuP Solder:

Usable for copper-to-copper soldering without flux; particularly suitable for soldering electric contacts, in the production of cooling equipment transformers and the like. Rapid heating and a narrow gap (0.07-0.12 mm) necessary to assure a firm joint. Not recommended where appreciable subsequent forming of the soldered object is planned. With flux (FB11-31), can be used with simple copper alloys (brass, bronze and the like). Not usable with nickel and its alloys, iron or any type of steel; for these purposes, PAg40CuZnCd is suitable.

[Table 2, continued]

PAg40CuZnCd

Usable with iron, low and high alloy steel, stainless steel, sintered carbide, nickel and its alloys, copper and its alloys, precious metals. This is a special silver solder, with the lowest melting range and working temperature, minimizing heating time. Particularly suitable for series and mechanized soldering. For delicate soldering of small components with narrow gaps, thin films, pipe, pipe nipples, connections to copper wire and cable, fittings, tools with high-speed steel and sintered carbide tips, surgical instruments, optical instruments, cooling equipment, electroplated brass musical instruments, production of lamps, lamp fittings and the like. Not recommended for wider gaps (PAg25CuZn and PAg30CuZnCd are more suitable for these purposes), or for soldering of plain cadium, e.g. for the foodstuffs industry (PAg45CuZn, PAg60CuZn and PAg66CuZn are suitable for these purposes). Harmful vapors must be exhausted during soldering.

Because no "ideal" electrolyte, capable of meeting all these requirements, has been developed, a large number of gold-containing electrolytes are offered, primarily by foreign producers. A good knowledge of the properties of plated surfaces and a sense of responsibility on the part of the designer or developer are essential for selection of the gold-plating electrolyte which will maximize conservation of gold.

The possibilities for conservation of gold used in the production of functional surfaces includes the following.

Local plating. The principle on which this method is based was described in the section on silver plating. Its use can decrease gold consumption by about 90 percent, in view of the ratio of functional surface area (switching and contact surfaces) to nonfunctional area. But in large-scale production this approach usually requires special fast-plating electrolytes and complex equipment. The technology is not yet so widely used in Czechoslovakia as it should be; it would be desirable to use it on the same scale as in other countries. With its use, the way is opened for designers to cooperate with manufacturing engineers in working out ways of saving scarce metals. One example of the use of local coating technology in Czechoslovakia is the gold-plating of contact strips for direct and indirect connectors (see Fig. 2). The functional surface is only a tenth of the total surface area of the connector.

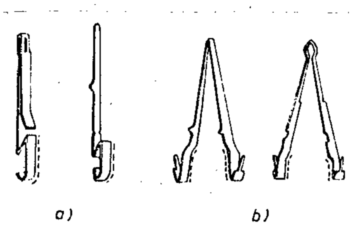


Fig. 2. Shapes of contact strips for direct (a) and indirect (b) connectors; the functional surface is indicated by broken lines.

### Lower-Purity Gold Coatings

Alloyed gold coatings, in which part of the gold is replaced by a base metal, are suitable for use in the gold-coating of design components, and particularly connector components, for electronics (e.g. contact strips for connectors). The coatings have a greater hardness and wear resistance than pure metal coatings. Several electrolytes which produce low-assay coatings are available on foreign markets. A gold-cobalt-nickel coating with a purity of 96-98 percent (Aurosaf electrolyte, produced by Safina Vestec) is commercially available in Czechoslovakia. However, this electrolyte has some drawbacks, primarily low current efficiency (the effective amount of current used to deposit the metal is about 35 percent) and the production of nonuniform coatings. These drawbacks have been eliminated by a newly developed electrolyte which is now undergoing semi-industrial tests. This is an Au-Cd (0.295% Cd) alloy electrolyte whose main advantage over the Aurosaf electrolyte is that it deposits coatings of uniform thickness and consumes less energy; the current efficiency is about 95 percent. The advantages of this electrolyte suggest that a saving of 15 percent might be realistically obtainable if it were used to coat planar contacts.

### Selection of Gold Coating Thickness

Because of the scarcity and high price of gold, the thicknesses of gold coatings must be chosen with even greater care than in the case of silver. Just as in the case of silver coatings, there is still no Czechoslovak State Standard governing the thicknesses of gold coatings. In general terms, we may say that the thickness of gold coatings for most connector components ranges from 2 to 5 microns for both pure or alloy coatings. These figures are in accordance with a proposal prepared by ISO according to which the thicknesses recommended for gold coatings for engineering purposes are 0.5, 1, 2.5, 5 and 10 microns. This draft also admits the use of other thicknesses, but the minimum thickness is 0.5 microns.

The use of an intermediate nickel layer in gold-plating is another possible way of decreasing gold consumption. The nickel undercoat makes it possible to decrease the thickness of the gold coating by a few microns, because nickel creates a diffusion barrier between the plated metal and the gold coating. For example, the use of an undercoat of nickel 3 to 5 microns thick would make it possible to decrease the thickness of the coating from 7 microns to 3.5 microns while maintaining the same connector durability.

### Gold Contacts

A smaller quantity of gold is used in electronics in the massive form. This is used primarily for contacts in low-voltage and measuring technology for currents between 5 and 100 mA (maximum 1 A) and voltages of 12 to 60V. The gold alloy AuNi5 (5 percent nickel) is most frequently used for this purpose. But recently, contact materials using AuAgNi have been developed and have undergone industrial testing. They have excellent mechanical properties, are extremely hard and wear-resistant, have a low, constant contact resistance

and are only slightly subject to transport phenomena. Table 3 compares some of the physical and mechanical properties of contact materials previously used and the newly-developed ones such as the alloy Au71Ag26Ni3.

| Materiál a | Měrná hmotnost při 20 °C kg/dm³ b | Teplota tavení Solidus °C c | Tvrdost $HV_{30}$ d | | Mez pevnosti σ Pt MPa g | | El. měrný odpor ϱ.10⁹ Ω.m h |
|---|---|---|---|---|---|---|---|
| | | | měkký e | tvrdý f | měkký e | tvrdý f | |
| AuNi5 | 18,3 | 995 | 100 | 190 | 290 | 590 | 138 |
| Au71Ag26Ni3 | 15,3 | 1080 | 95 | 155 | 350 | 570 | 113 |

Table 3. Physical and mechanical characteristics of gold contacts

Key:
- a. Material
- b. Density at 20° C, $kg/dm^3$
- c. Melting temperature, solidus, °C
- d. Hardness $HV_{30}$
- e. Soft
- f. Hard
- g. Limiting strength
- h. Electrical resistivity

Gold Microwire

Gold microwire is used in integrated circuit packaging to connect the system itself (the chip) to the package leads. Gold is excellently suited to this operation, since it can be joined easily to other metals by thermocompression at temperatures and pressures well below those which would melt them.

Finding ways to save gold in this application involves many problems, economic as well as technical. Basically, there are two ways to conserve gold.

--Decreasing the diameter of the microwire. For example, using 22.5-micron wire instead of 25-micron wire yields a 22.5 percent saving of gold, although it is necessary to make changes in the machine inventory.

--Replacement of gold microwire with a base metal (aluminum). Some problems arise in this replacement; for example, aluminum wire cannot be welded by thermocompression, but only ultrasonically. Other shortcomings are, of course, the short storage time and the high purchase price.

Gold Foil

Foil made of a gold-antimony or gold-silicon alloy is used in microelectronics to solder chips to their packages. This process makes use of gold's notable property of forming an extremely low-melting alloy with silicon.

Conservation of gold involves primarily a decrease in the thickness of the foil used. By beginning the production of foil 15 microns rather than 25 microns thick it would be possible to save about 50 percent on the gold used for this purpose.

8480
CSO: 2402/38

## BRIEFS

VEHICLE EXPORTS TO USSR--Czechoslovak motor vehicle exports to the USSR during the 1981-1985 period will include 21,400 Tatra trucks; 11,250 Avia trucks; 13,000 Orlican refrigerated trailer vans and Skoda tractor-trailers; 500,000 motorcycles, almost 10,000 loaders and over 3,000 tractors for forestry operations. Production of the Tatra-815 heavy trucks is increasing. These trucks are equipped with new 8, 10 and 12-piston air-cooled diesel engines T 3-930 of 170-300 kw output. Tatra T-815 Arktik truck has been produced for service under difficult operational and climatic conditions. It has a heated cargo area, very effective cab heating, auxiliary equipment for starting engine under extremely cold conditions, as well as other features developed during its testing in Siberia. In 1980, talks were held on possible CSSR-USSR cooperation in development of a modern passenger car which would need less materials for its production and have a low fuel consumption. [Prague SVOBODNE SLOVO in Czech 13 May 82 p 3]

CYCLONE REACTOR PRODUCES ANTIMONY--Trial run of the so-called cyclone reactor for production of antimony is currently taking place at the Slovak National Uprising Plant in Vajskove. First of its kind in Europe, the cyclone reactor can process even low grade ore. Yearly production of antimony at the plant is expected to reach 2,000 t, compared with current 1,000 t. [Prague ZEMEDELSKE NOVINY in Czech 7 May 82 p 8]

CSO: 2402/51

DIRECTOR OF COMPUTER APPLICATIONS ENTERPRISE INTERVIEWED

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 pp 2-3

[Interview with Janos Juhasz, director general of the Computer Technology Applications Enterprise, by Dr Ivan Szabo]

[Text] The Computer Technology Applications Enterprise (SZAMALK) came into being on 1 January 1982 on the basis of a position taken by the Science Policy Committee and a resolution of the Central Statistics Office by reorganizing three computer technology organizations (SZAMKI [the Computer Technology Research Institute], OSZV [the National Eomputer Technology Enterprise] and SZAMOK [the Computer Technology Training Center]) into a new, technical development type enterprise.

The purpose of its creation was to concentrate resources and thus aid execution of the Computer Technology Central Development Program (SZKFP), increase the scope of research and development achievements, contribute to the development of computer technology applications, aid the practical realization of R and D results, develop training, operations technology and service forms and increase, by virtue of a more coordinated and swifter development of applications tasks, the economic results which can be attained through use of the tools.

[Opening Statement] Taking into consideration the national requirements and based on the attributes of the three organizations the tasks of the SZAMALK are the following:

1. Creating out of import and domestic computer technology elements those acquisition and marketing systems and configurations which correspond to the applications guiding principles and tasks, providing software for them, operating them, developing technologies which increase the efficiency of applications, maintaining them and providing parts.

2. Computer technology research and development. Creating applications systems of national economic significance by use of modern technologies.

3. Planning the installation of computer systems and installing systems. This activity is carried out on a subcontracting and prime contracting basis.

4. Providing specialist training. Providing special training for products marketed or manufacuured by the enterprise.

5. Providing information, forecasting and observer services.

[Question] What are the chief characteristics of the new enterprise in regard to enterprise type?

[Answer] The enterprise is a developmental enterprise of the complex engineering type. It will concentrate its activities on accelerating the innovation process, optimalizing computer technology development and implementing efficient technical-economic actions; this will be done in an entrepreneurial fashion, undertaking rational risk.

It will prepare for practical utilization of the achievements of research and development. It will do this with a precise definition and harmonization of "daily" and long-range developments.

It can market the results of its activities independently, but increasingly in the form of complex "products."

[Question] The SZAMALK is a base institution of the Central Statistics Office. What will determine the developmental trends of the enterprise and what chief enterprise tasks will be linked thereto?

[Answer] The SZKFP will determine the direction of enterprise developments. In accordance with this the chief task of the enterprise as a many-sided development of computer technology applications, increasing their efficiency. We calculate that the degree of cumputerization and the development of applications in our homeland have already reached the level where we can post as the goal the unfolding of an intensive development based on quality factors, the spread of modern computer technology procedures and methods.

[Question] What are the most important enterprise development goals?

[Answer] To mention only the really most important, they are the following. Increasing the goal-orientation of scientific research and development tasks which can be regarded as new; aiding their application; developing elements which increase efficiency in machine use, in technology and in services; and the spread of systems which can be standardized. Our goal is to increase the economic results which can be attained through applications and to help make economic processes more coordinated.

[Question] What are those chief enterprise activities the development of which, after the merger or vertical integration, will serve as a means for the fulfillment of the tasks of the enterprise?

[Answer] Without going into every detail, I would mention the following chief aspects. The functioning of the enterprise will be characterized by entrepreneurial activity; it will prepare, coordinate and organize entrepreneurial actions. These undertakings will pertain primarily to complex computer

technology applications tasks and systems which can be standardized but will extend to the solution of ad hoc tasks also, including consulting, feasibility studies, research and development on concrete tasks, methods and technologies, as well as teaching and providing a broad range of services--planning, execution, operation, etc.

Actions will be carried out primarily in the form of developmental undertakings. The enterprise will cooperate with all those domestic and foreign organizations which can contribute to the effectiveness of the undertakings.

We plan to realize our entrepreneurial activity at two levels. At the enterprise level, for example, we will market computer systems, parts and auxiliary tools. At the level of the enterprise professional offices we will do those things which are not of a complex character, where the professional offices have all the conditions for successful realization. I am thinking here, for example, of training and service activities.

Basically we will carry out our activities on the basis of orders; but we will do our educational and information work primarily on the basis of a state commission.

[Question] How will research and development on enterprise applications systems change?

[Answer] The integration processes taking place in the people's economy require a better coordination of the R and D-production-marketing chain. To a crucial extent socialist import and domestic production determine the technical level of applications development. SZAMALK must increase the ability of the available tools to meet the tasks. For exmmple, with solutions which increase reliability and adaptability. And further, with complex applications which can be standardized and adapted to various levels, with technical further development, with software development, by decreasing the time needed to introduce a system, etc.

[Question] In what way will the software research and development of the enterprise be linked to the computer investment possibilities of the Sixth Five Year Plan?

[Answer] SZAMALK will handle about half of the computer investment of the Sixth Five Year Plan.

We must regard the supply of software for the ESZR or MSZR machines sold by the enterprise, the development of key systems and the introduction of these systems to be the most important tasks of the enterprise.

As the largest domestic systems enterprise SZAMALK must participate in the development of significant user and model systems which do not have an adequate supply of software. In the interest of an effective performance of this activity we must organize software manufacture, for which we will need a staff of highly qualified experts.

We must analyze the installation, tuning and follow-up costs deriving from the deficiencies of machine acquisition; we must make use of the market mechanism when determining the number and composition of framework systems (DOS/OS, VS, VM, RSZ-11). The framework systems must ensure the modern data base oriented, remote processing operational mode also.

Due to capacity considerations and the significance of results achieved thus far by the several institutions we must develop for this work a proper division of labor with other institutions also.

[Question] How will research and development be linked to the services provided by SZAMALK?

[Answer] The basic requirement is that SZAMALK bring user needs and the possibilities offered by system deliveries into harmony with its own complex developments and services.

We will solve hardware-software development for given systems partly with our own intellectual capacity and partly by bringing in outside institutes, in accordance with the conditions of research and development contracts tied to results.

[Question] How will the enterprise handle instruction; what are the fundamentally new aspects of this basis activity?

[Answer] Computer technology training must be developed further on the basis of the development realized in the past 10 years. Taking into consideration the trends of development we must count on increasing demand for special users and continual further training. As a result of the creation of new computer centers, the movement of experts, the increase in user needs and the expected increase in the mobility of our entire society there is also increasing interest in the training of experts in specialized study courses. But the slower increase in the number of computers will cause a ratio change in the area of expert training.

With the increase in the leadership level of enterprises the computer technology training of leaders is coming into the foreground. Training must keep pace with domestic development and the research and development and service activities of the enterprise so that, acquainting people with the new tools and methods, it can increase the demand for more developed computer technology products and services and increase the receptivity of trained experts.

SZAMALK must develop expert training, product-oriented and machine-oriented training, further training and leader training into a uniform interrelated system. Training will be done partly with independent actions and partly in close cooperation with the developmental and service activities of SZAMALK.

[Question] The openness and objectivity of information are interdependent with incentive, with calling attention to the new. What is the task and goal of information in the new organization? Might not its partiality mean a bias toward a narrower spectrum (the realization of the interests of SZAMALK)?

[Answer] The goal of the information activity of SZAMALK is a double one. On the one hand it must provide information to organizations, experts and users interested in computer technology applications, as a national task; on the other hand it must provide information to the various branches within our enterprise and to the experts working in them, information needed for professional and efficient use of computer technology, realizing selectivity and speed and satisfying the need for concrete news. In accordance with national interests, influencing and forming professional views will determine the central tasks for information. One might also list here those tasks which give an account of the developmental trends of computer technology, with special regard to domestic needs and possibilities, to the entrepreneurial and investment spirit attaching to the use of computer technology and to a positive influence on demand.

Another stressed information task is to call attention to the actions, undertakings and services of the Central Statistics Office and its institutions, and the enterprise itself. The results achieved in the use and development of modern computer supported information technology will be handed on to other institutions. Our research and development achievements will be published in a professional way.

The editing, preparation, publication and distribution of professional books and textbooks, various publications and mathodological and other proposals and guides belong in the sphere of information. Preparing commercial brochures on hardware and software products, editing the professional computer technology journals of the Central Statistics Office (SZAMITASTECHNIKA and INFORMACIO-ELEKTRONIKA), and taking part in the editing of the international collection of computer technology articles (SBORNYIK) belong here also. This activity also includes maintaining a public computer technology library, operating it as "national task professional library," developing and operating a computer supported professional literature information system and providing continual and ad hoc services using our own, domestic and international data bases.

[Question] Will the computer technology technical services change? Will these activities, in the future, be inspired by the obligations and services characteristic of a trade mark service?

[Answer] By virtue of its technical services SZAMALK must help prepare the users to receive computer technology tools. It must support the development and operation of efficient systems. It must carry out those trade mark service tasks which are usually carried out by the manufacturing base in countries manufacturing computers. Within the enterprise these activities will involve giving advice, planning and carrying out computer investments, training, maintenance, ensuring trouble free operation, putting computers into operation, collecting and analysing information and providing feedback to the manufacturing enterprise--in the interest of technical development.

It will also include the coordinating activity needed for commercial policy questions of the enterprise, participation in international testing and work organs, where we must realize the domestic applications and technical service requirements.

We must prepare for the fact that in the coming decade technological development will shift in the direction of the very large and the very small (but very efficient) machines, as part of increased integration. Because of the high degree of integration we must work out and introduce entirely new technologies for maintenance and repair.

[Question] What does the leadership of the enterprise plan in the area of parts supply and materials supply, an area such debated over the years although not yet provided for in a reassuring way? Will it set conditions, will it employ sanctions against those shippers the activity of which might restrict continuous operation? Will there be a change in regard to setting up consignment warehouses for ESZR systems?

[Answer] In the interest of the security and efficiency of operation SZAMALK will ensure a national parts supply for imported computers manufactured within the framework of inter-government computer technology agreements and sold domestically. The acquisition of parts will be harmonized with the acquisition of computers from socialist countries. In the interest of the effectiveness and quality of supply we must pursue the following chief goals: direct parts acquisition from the manufacturing plant must be institutionalized. When signing foreign trade contracts, simultaneous with this or as a condition for signing such a contract, we must sign parts supply contracts. Insofar as possible the precise adherence to contracts and providing the documentation needed to order parts must be the subject of sanctions on shippers. This is a basic condition if we are to be able to place orders in accordance with existing machine inventories. In the area of active electronic elements we must strive to prepare an appropriate replacements list, to make up for shortages and save foreign exchange.

We must also make a gradual attempt to carry out standard tests on parts and to organize renovation at the parts and subassembly level. For both technical and economic reasons we must try to see to it that the enterprises of socialist countries also maintain or establish consignment warehouses.

We must regard a supply of the special materials needed for efficient operation of computers as an organic part of the services offered by SZAMALK. In this regard the enterprise will carry out organizing, acquisition and marketing activity.

[Question] Prior to the vertical integration all three institutes and extensive international contacts. Will this area receive a new aspect within SZAMALK?

[Answer] The contacts, and the further development and strengthening of them, will be fundamentally influenced by the fact that the activity of the enterprise rests on an import base. The existing international contacts will survive, naturally, and a development of them is to be desired. For this reason they have an important place and role in the operations of the enterprise. We consider the acquisition of information, the development of concrete cooperation, support for commercial activities and the cultivation of contacts based on inter-state agreements to be very important tasks. We

especially want to strengthen those which might bring economic achievements for the enterprise and for computer technology applications.

We will continue to cultivate those bilaterally advantageous international contacts which SZAMOK developed and continued in past years with the UN and other international organizations--UNESCO, UNDP and UNIDO. In this way we will be active participants in the institutionalized international exchange of experience which is increasingly indispensable due to the international character of computer technology.

[Question] Might the limited investment possibilities of the Sixth Five Year Plan and other professional considerations mean that in this period SZAMALK will handle the marketing of small computers, complex technical services and software development as stressed tasks?

[Answer] We carried out a circumspect analysis within the enterprise and outside of it. The purpose of this was to survey our resources and define those personnel and objective conditions necessary to carry out the task on the basis of market needs. Our enterprise prescribed the acquisition of a number of special purpose MSZR items. This equipment is intended to aid hardware development, adaptation and training, basic software development in at least two directions (RT 11 and RSX-11/M), user software development, the development of model systems, instruction and services, including the exchange of units during repairs. We consider it very important that, in the interest of realizing our goals, we cooperate with the KFKI [Central Physics Research Institute], because this cooperation could increase our resources and decrease throughput times. It can be seen from all this that we ascribe a very important role to the development of well functioning, well equipped user systems. We can carry out this task only with domestic development and system integration.

Taking into consideration the limited investment possibilities we think that beginning users will be the primary users of these systems, but the purchasers will include those experienced users who want to use the systems for data input and data processing functions.

We are also counting on more complex needs of the so-called big users, such as network control and the computerization of technical, design and process control tasks. Among the tools to be considered I might mention the TPA 1140, TPA/L, TPA/S, TPA 70, TPA 11/EMU, ESZ 1011, VT20 and ESZ 1010M systems of domestic manufacture and the MSZR 3, MSZR 4 and other equipment deriving from socialist import, such as the Elektronika 60 and the MERA 9150 equipment.

[Question] The external contacts of the institutions forming the SZAMALK will not end with the merger. But the earlier contacts of these institutions with each other are being transformed into new internal and more complex contacts. In regard to outsiders SZAMALK will satisfy all those needs previously satisfied by its predecessors. At the same time a number of new possibilities arise, both quantitatively and qualitatively. Taking these aspects into consideration and for the purpose of information and orientation, please describe the enterprise hierarchy and structure, with special regard to the most important organizational units.

[Answer] The director general stands at the head of the enterprise. His work will be aided first of all by the Director's Council, the deputy director general, the Applications Development Council and the organs of the enterprise staff. The deputy director general will oversee the Service and Trade Directorates.*

[Question] In the course of carrying out future tasks, in my opinion, the Trade Office of the SZAMALK--together with the other professional enterprise offices--will have an outstandingly important role in regard to the future of and the profitability of the enterprise. As part of the marketing of new computers this office must formulate needs on the basis of user requirements and break the tasks down into elements for the offices of the SZAMALK. Permit me to formulate my question in the following manner: In such cases, how will SZAMALK "attack" the enterprises or the potential tasks?

[Answer] In regard to a successful execution of the task the role of well prepared market research agents and propagandists is fundamental. No less important is cooperation between the Trade Office and the other professional offices of SZAMALK. We can call this the critical point in regard to the functioning of the enterprise. Actually we must speak of the decentralized nature of the undertaking, which means that we are counting on the appearance of a large number of prime contractors in-house. To return to the agents, let me describe their activity. The agents will work according to economic branch or sub-branch or international relationship. Our Trade Office will work out enterprise trade policy plans for the enterprise; these will be discussed by the enterprise council, made up of the chiefs of the offices, which will transform them into tasks for the professional offices. In a natural way the guiding principles of the national acquisitions policy will influence the enterprise trade policy plans.

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*The Research and Development Directorate embraces three offices.

The offices and their units are the following:

Development Office: with main departments for technical development, small computers, data preparation, remote processing, systems development and programming systems.

Applications Development Office: with main departments for applications program systems, enterprise organization and applications, informatics, applied mathematics and methodology.

Instruction Office: with main departments for organization sciences teaching and computer sciences teaching, a technical and operations main department, as well as an instruction organization and planning department and a teaching techniques studio.

The Service and Trade Directorate includes four offices and one independent main department. The Trade Office has main departments for computer systems, parts and cooperation and marketing. The Technical Services Office has main departments for technical services, preparation of sites, customer service, and technical coordination and supervision. The Information Office has main departments for editorial and publication work and a library and documentation main department. The OSAK [expansion unknown] is an independent main department. The Computer Services Affice embraces a services development main department and computer centers I, II and III.

After the decisions of the council the propagandists will initiate advertising and propaganda actions. The market researchers will study user needs not only in a static way; they will also analyse the effect of their own work and of the advertising and propaganda and evaluate the satisfaction of the users, the success of the business, from professional and trade viewpoints. So the links between the Trade Office and the other professional offices of SZAMALK will create an almost organic net. Intricate multilateral internal contacts will develop between the offices. An enterprise council made up of office leaders will coordinate these contacts and it will designate the prime contractors within the enterprise. Naturally this means that at any one time a number of prime contractor is a guarantee that the user needs incorporated in the contract will be met in a coordinated way.

Naturally, carrying out these tasks requires the creation of a very well qualified staff of sufficient size. We need people of the manager type who are very well acquainted with and can use in a complex way the procedures of commercial, economic, computer technology, building utilities and state administrative organs.

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## HUNGARIAN PLANS, NEED FOR COMPUTERS HIGHLIGHTED

Budapest NEPSZABADSAG in Hungarian 10 Apr 82 p 11

[Article by Zsuzsa Szentgyorgyi: "Do We Need Computer Technology?"]

[Excerpts] Our present computer capacity has significant shortcomings. On one hand, it is suitable only for the performance of computational tasks already considered conventional, and we have very few tools suitable for the performance of tasks in computer graphics and text processing, which are becoming widespread in highly industrialized countries. (Such tasks arise in industrial process control and office automation.)

There is a poor selection of graphics and text-processing tools on the domestic and socialist market, in spite of the fact that the selection of precisely these tools has greatly increased in the world in the past few years.

As another disadvantage, computer tools are not directly accessible. Many technical experts are reluctant--let us admit with good reasons--to turn in a program package for the solution of a problem to a more or less closed computer center from where it will be returned with error messages after a few days; but even if they are lucky and there are no errors, it may take a day or two to run the program.

Thus it is no accident that in the last decade remote data processing became the most important and fastest-growing area of computer technology. If the user can directly access the computer via some type of remote device--terminal--then he (she) has the opportunity immediately to modify, correct and change his (her) program and directly access the results. The situation is somewhat analogous to sending a telegram by walking to the post office several streets away from our home (which may or may not be open and may or may not accept the telegram) and being able to send it via our home phone. The comparison is good as far as the telephone is concerned. Unfortunately, one of the significant hindrances encountered in the development of computer terminal systems and nets in our country is the absence of telephone nets. (According to international statistical data of 1 January 1979, the present telephone density in our country is 5.2 exchanges per 100 people, while countries similar in size and economical conditions show the following values: Austria 28, Greece 22.7, Czechoslovakia 10.6, Bulgaria 8, GDR 7.9, Romania 6).

However, it must be added that at the present our computer centers could not even serve users in the conversational mode.

Even with these hindrances, there is an extraordinary need for computer technology in our country. In the current 5-year plan, within the framework of the central computer development program, the branch and central managerial organizations proposed 30 large companies (distinguished in the production of national wealth and export to capitalist countries) for the introduction of integrated computer systems that cover their entire production and economy. In the case of production enterprises "to be integrated" is also connected to the automation of technological processes. It would take up too much time to name all of them; so we shall mention only a few: the National Oil and Natural Gas Industry Trust, the Hungarian Electrical Works Trust, the Taurus Rubber Industry Company, Videoton, the United Incandescent Light Works, the Paper Industry Company; the Hungarian State Railways (MAV), the post, the National Savings Bank (OTP); the Budapest Meat Industry Company; Chemolimpex, Mogurt, Terimpex; a reservation system including five hotels and tourist offices.

It would be difficult to classify all those applications in which the use of computer technology is already indispensable; i.e in which in developed countries--in spite of the economic recession, or perhaps as a way to overcome it--computer tools and methods are used in increasing quantities. It is possible only to highlight a few, since today there is no branch of the economy or social managerial organization in which the use of computers is not possible and not required.

One of the most important ones is computer-based design and production, ensuring the competitiveness and quick appearance of new products. Today, in many cases, this is accomplished in a unified system. In our country, there are some initiatives at the research-and-development and experimental-use level.

In computerized design, we can talk about several years of domestic experience. In the recent past, during the organized meeting of the National Technical Development Committee and the Hungarian Academy of Sciences, national experts gave account of the present achievements and were surprised how multifaceted and widespread the application of computer tools is in the designing of electronic, electrical, mechanical devices and systems and construction industry installations. The role of computerized design is especially important, one could say--without exaggeration--vital in the currently initiated microelectronic device and component manufacturing program.

Administration and bookkeeping are the most difficult part of management and require the most amount of labor. In the past 2 years, there has been a tremendous selection offered for the mechanization and automation of bookkeeping. These are often composed of modules which can be configured rather inexpensively or expanded in stages. The only trouble is that failures and delays in the application are usually caused--not only in our country--by the organization and computer adaptation of bookkeeping.

Computer technology is conventionally used for the controlling of technological processes. New possibilities are offered by relatively inexpensive and small microprocessor systems, which require minimum supervision and personnel; these can be used partly for the substitution of the earlier individual controllers, and partly with an expansion of computer tasks, and--in the appropriate configuration--as independent controller systems.

Integrated communications systems, recently referred to as teleinformatics, combine the advantages of computer technology methods and those of communications. Via the system including a TV set and an adapter, large central data bases and information files can be quickly accessed at the workplace or even at home. Today, such systems are available only in the experimental operating mode in most countries, e.g. the English Teletex and Viewdata, the French Antiope, or their Canadian and West-German equivalents. Experiments have already been initiated also in Hungary with the cooperation of Orion and the Budapest Technical University, and regular service is expected by the end of the decade.

To support, develop and popularize the above-mentioned trends and tendencies, the central computer development program is making a significant effort. Since, as mentioned, the development of microelectronics, computer technology, telecommunications and automation today can no longer be separated, the central computer development program is joining the central electronic development program (initiated by a government resolution at the end of last year) in several areas (e.g. in the area of computer-assisted technical planning, or--at the other end--with the electronic device base to be developed in our country.

Projects supporting research and development are the essential and progressive parts of central development programs. For instance, the national program aiding computer applications provides central guidance, financial support in the most diverse areas (agricultural and food industry systems, council bookkeeping, education, electronic design, etc.) to facilitate the mass use of these methods and model systems. The National Technical Development Council, the Ministry of Industry and the Hungarian Academy of Sciences are promoting with common research and development programs the national production and spreading of microprocessor systems and controls and the application of computer tools and methods in the automation of production processes.

As we can see, computer technology has already grown strong roots in Hungary and become an indispensable tool, and we can rightly say that there is a real need for it. What is most important: a receptive culture has been created, without which it would be a waste of money to buy and install any further tools. This culture involves more than just the 20,000 full-time computer experts; it also includes those people with other professions--doctors, architects, mechanical engineers, economists, sociologists, to mention only a few--who use computers in their day-to-day work. This developmental trend has extraordinary sociological correlations in education, professional training and the planning of the work force structure.

Do we need computer technology? Today this is no longer a question, because without it we cannot keep pace with the development of the world. The real question to be answered every day in the 1980's involves more than just asking: "What do we need computers for?," because it is easy to make up request lists, but to answer how we can use computer technology most effectively for the development of our society and economy, taking into account our financial potentials and possibilities.

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## NEW BULGARIAN COMPUTER DEVELOPMENTS

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 3

[Article by Georgi Nikolov: "New Developmental Trends in Bulgarian Computers"]

[Text] The active participation of Bulgaria in computer technology development and manufacture within the framework of the ESZR [Uniform Computer Technology System] made possible series manufacture of the already well known medium capacity computer models ESZ 1020, ESZ 1022, and ESZ 1035. In the course of creating these computer models research was done in the area of expanding functional possibilities and achieving a better performance/price ratio.

In the newest ESZ 1035 model (delivery began in the recent past) they introduced qualitatively new solutions along with increased performance--160,000 operations per second. The new solutions include organization of virtual memory, a reloadable control memory and automatic error correction in storage. New technical devices can be used also: a picture screen operator's console, operational storage based on integrated circuits, 200 M byte disc background storage and magnetic tape storage with a writing density of 1,600 bits per inch.

In our judgment if one is to greatly increase user efficiency it is not enough only to increase capacity. Research has shown that the best way to increase efficiency may be to use special technical and programming tools. These tools are developed to solve concrete tasks but they can be used widely.

In general these developments require the arithmetic processing of large volumes of information, so they developed and are manufacturing the ESZ 2335 special matrix processor. This equipment significantly increases performances (in the case of addition, multiplication and division) and it has a speed of 10 million operations per second. The matrix processor can be connected through a special adapter unit to the central unit of an ECZ 1035 computer. For certain types of tasks this can increase the performance of the computer 35 times. On the basis of the matrix processor and the ESZ 1035 computer they worked out a special computer technology system for the processing of seismographic information. This can be used especially in the course of geological research and petroleum and natural gas prospecting. This task was solved in Bulgaria for the first time in the socialist countries.

The other chief trend for increasing efficiency is to accelerate the writing, systematising and retrieval of large volumes of information. For this purpose they devised a subsystem which, thanks to its technical solutions, makes it possible to write incoming information at a speed of a maximum of 6.5 M bytes per second onto magnetic disc storage with a capacity of 100 or 200 M bytes. The subsystem can be connected via a standard ESZR adapting unit to the block multiplex channel of any ESZR computer. This is the first step toward the creation of high efficiency data base control systems. It can be used in many areas where large volumes of information must be written quickly and retrieved in an associative way. If we connect the system described above to the previously mentioned matrix processor then we can create an efficient mathematical information processing system.

The ESZ 1035 computer--which, on the basis of its capacity, we can list in the medium capacity computer category--can be developed into a system which is competitive with the large capacity computers of the ESZR, and this can be done without significant material expenditures.

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HUNGARY

NEW TASKS IN COMPUTER APPLICATIONS

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 1

[Article by Lajos Pesti, vice-president of the Central Statistics Office: "Our Tasks in the New Phase of Computer Technology Applications]

[Text] These days in our homeland also the application of computer technology has entered a new phase. The requirements of this new phase are set down by the April 1981 resolution of the Council of Ministers, which approved the detailed guiding principles of the Computer Technology Central Development Program pertaining to the Sixth Five Year Plan, and by the November 1981 resolution of the State Plan Committee, whereby the concrete action program developed on the basis of the guidelines was adopted.

These resolutions require substantial substantive changes in the application of computer technology, because the change in the social-economic environment has an essential influence on the applications possibilities of computer technology. But also because enough domestic experience has collected already in a number of areas of new applications technology--such as data base management, structured program design, interactive program development, remote processing, etc.--that their broad utilization has become realistically possible or timely.

All this makes it necessary for us to review our tasks and reevaluate our methods on the basis of the state resolutions. If I wanted to characterize applications work thus far, in a summary and greatly simplified way, I would have to say that thus far we have followed an essentially extensive developmental policy--due to the relatively late beginning of a broad application of computer technology. In general we have set "quantitative" goals--increase the number of computers, exchange the existing ones for larger ones, increase the personnel of professional institutions, create large professional organizations and so forth.

Already today and in the future our developmental policy must be directed at making applications more intensive. It must be recognized--and this is reflected in the new five-year Computer Technology Central Development Program which has been approved--that the central resources for computer technology, the investment and foreign exchange frameworks, cannot be increased, rather they will moderate, so we must choose not the simpler but more expensive

methods, rather we must choose the more complex, more demanding but more efficient and more economical methods.

Fortunately such methods are at our disposal. In regard to hardware developments it is possible to expand or exchange domestically developed storage--instead of exchanging computers in order to increase capacity. (More extensive information on this can be found in this issue.) Storage expansion--where it can be used rationally--will open the possibility of converting to higher level operating systems and making use of interactive or multiprogramming techniques.

Along side the larger computers (and increasingly as a rational replacement for them) the use of "more but smaller machines" has come on the agenda. Naturally the advantage of more smaller machines can be exploited within a single system only if it is possible to realize a physical link at a certain level between the machines. There is domestic experience in realizing machine-machine or channel-channel links--if, unfortunately, not much for the time being.

Organizing computers belonging to different systems into a network represents another intensive resource. Those computer centers charged with building up their networks may have been surprised to learn that the Hungarian Posts is already capable of providing X.21 level line-connected network service.

So the time has come to put on the agenda the development of a national model for remote processing networks so that the network elements or units should be built up according to some rational ordering principle, instead of having many small, autonomous networks. Such a model would represent a "reference point" for domestic manufacturers in regard to adaptors, controls, etc.

The technical conditions indicated above will make possible the use of more developed software technologies. A broad variety of remote processing methods is needed to develop "tele-informatics." The requirements of a given application must determine whether use of a TSO or a TP monitor or the creation of an RJE, CRJE or interactive man-machine link is most efficient. But the conditions necessary for this must be available system by system, and in this event we must encourage the introduction of more developed procedures, instead of "conservative" applications methods, always keeping in mind user efficiency and economicalness.

It appears that with the gratifying spread of the IDMS program system data base management is finally entering mot only as a theme for domestic conferences but also the everyday instrumentarium of users. So we must adjust our system design and organization methods to this new possibility. The same thing applies to program development methods also because structured program design, automatic program documentation, etc. are still the favored area of researchers rather than the daily applications practice of computer centers.

At present the organization of a few chief authorities, trusts and large enterprises is undergoing modification or development. Organization development has become timely in the area of computer technology applications also. Such

developmental aspirations must serve the intensification of applications also. Recently there has been a gratifying reduction in the organizational isolation among the several economic branches, and this trend must be strengthened. Export and service bases oriented toward applications functions must be developed in the branch organization-development institutions. At present they are dealing with each applications theme in virtually every organization-development institution but one can hardly find any unique specialization in these institutions, outside of the branch profile.

As we can see, the new phase of computer technology application represents a "challenge" for our applications experts, in regard to how they can do more efficient work and achieve more and better results with less expenditure. This also requires from the domestic development and manufacturing institutions that they give priority to those developmental themes, those design and technological developments, which will facilitate adaptation to the new phase. Finally, this also gives a greater and more complicated task to those directing applications, because it requires a higher level applications development policy, a more efficient incentive system in the right direction and the making of decisions in a more complex environment.

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RESULTS OF USING DOMESTIC COAL FOR COKING

Budapest KOHASZAT in Hungarian Vol 114 No 12, 1981 pp 513-517

[Article by Pal Gonczy, graduate metallurgical engineer, Danubian Ferrous Metallurgical Works: "Evaluation of the Trial Use of Metallurgical Coke Made From 100 Percent Komlo and Pecs Coal in Metallurgical Operations"]

[Text] Since domestic manufacture of metallurgical coke has started, only a relatively small percentage of domestic coal was used to make the coking-coal blends. Trial coking was carried out at Danubian Ferrous Metallurgical Works from 100 percent domestic coals. This article describes the experimental manufacture of pig iron with such coke.

A large-scale trial for the use of metallurgical coke made from a mixture of cokable domestic coals was carried out in the two blast furnaces of the Danubian Ferrous Metallurgical Works between 26 and 31 March 1981.

The trial was especially interesting since the coke had to be made at the same time as the metallurgical processes took place, so that the characteristics of the metallurgical coke were not known. Also, it was necessary to ensure that the blast furnaces continue to produce normally during the trial since the steel mill had to be continuously supplied. Last but not least, in spite of the major change in the coal mixture to be coked -- and thus also in the metallurgical coke -- a significant period of one week had to be successfully operated. The true significance of the trial is that we have used at the Danubian Ferrous Metallurgical Works such coke for the first time, and that we have produced coke made from 100 percent domestic coals for the first time since a long time. It is a generally known fact that domestic coals (from Komlo, washed at the Works (DV), and from Pecs) accounted for only about 50 percent in the coal mixture used to make the coke before.

It should also be mentioned that the reference period selected was 1-25 March 1981 -- the period preceding the test period (26-31 March 1981). Only then could we make reasonably sure that the ore batch in the blast furnaces was uniform and comparable (for example in terms of sinter and high-iron concentrate in the specific batch).

## The Ore Batch in the Blast Furnaces

Comparison of the metallurgical operations in the reference period and in the test period, and the determination of the changes caused by switching from one coke to another is facilitated if the specific ore batches and the specific concentration of the major ingredients in the ore batches are about the same. For this reason we attempted to ensure that no major changes take place as we went from the reference period to the test period. It was therefore necessary to examine the ore batch. The ore batch is not the same as the ore mixture; the former also includes the coke, and the switch from one coke to another affects the amount of slag-forming material and thus also the specific batch. Table 1 shows the amounts of materials used during the reference period and during the test period. Table 2 shows that one ton of pig iron was produced from 1,967.5 kg ore batch during the reference period and from 1,966.4 kg ore batch during the test period. The difference was very small, 1.1 kg per ton of pig iron. The reason for this was that (1) the ratio of the sinter and Indian ore on the one hand, and the Swedish ore on the other hand -- which accounted for the major portion of the ore batch -- was close over the period (see Lines 1-3 in Table 2) and (2) there were no significant differences in the chemical composition of the sinter -- made at the Danubian Ferrour Metallurgical Works -- during the two periods.

## Quality of the Metallurgical Coke

The properties of the metallurgical coke are determined by the basic properties of the coals coked, the technological equipment, and the manufacturing technology. In the course of the test, the only change between the reference period and the test period was that the coal mixtures used to make the coke were different. The specifics of this difference are shown in Table 3; the individual coals used differed in composition and other characteristics.

Table 1. Material consumption, production, and time data of blast furnaces

| Item | Designation | 1-25 March 1981 (reference period | 26-31 March 1981 (test period |
|---|---|---|---|
| 1. | DV sinter, tons | 81,880 | 21,080 |
| 2. | BEM sinter, tons | 18,968 | 1,846 |
| 3. | Indian ore (116), tons | 20.518 | 4,317 |
| 4. | Swedish ore, tons | 2,127 | 742 |
| 5. | Iron chips, tons | 1,949 | 66 |
| 6. | Oxidic manganese ore from Urkut, tons | 457 | 57 |
| 7. | Martin slag, tons | 3,914 | 1,169 |
| 8. | Solder slag, tons | 90 | - |
| 9. | Ore mixture (with fly dust), tons | 129,903 | 29,277 |
| 10. | Ore mixture (without fly dust), tons | 126,570 | 28,525 |
| 11. | Limestone, tons | 2,396 | 1,526 |
| 12. | Bulk dolimite, tons | 3,206 | 1,837 |
| 13. | Mixture (with fly dust), tons | 135,505 | 32,470 |
| 14. | Fly dust, tons | 3,333 | 752 |
| 15. | Mixture (without fly dust), tons | 132.172 | 31,718 |
| 16. | Metallurgical coke, tons | 41,426 | 9,905 |
| 17. | Residual oil, tons | 4,006 | 972 |
| 18. | Pig-iron production, tons | 66,023 | 14,889 |
| 19. | Downtime, days | 0.743/<br>0.837 | 0.090/<br>0.117 |
| 20. | Operating time, days | 24.257/<br>24.163 | 5.910/<br>5.823 |
| 21 | Calendar days, days | 25/25 | 6/6 |

Note:
The data under items 19 to 21 refer to Blast Furnace I/Blast Furnace II

Table 2. Specific material consumption data

| Item | Designation | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period |
|---|---|---|---|
| 1. | Sinter, kg per ton of pig iron | 1,527.5 | 1,539.8 |
| 2. | Indian and Swedish ore, kg per ton of pig iron | 343.0 | 339.8 |
| 3. | 1 + 2 | 1,870.5 | 1,879.6 |
| 4. | Specific ore mixture, kg per ton of pig iron | 1,967.5 | 1,966.4 |

Table 3. Amount of coked coal mixture in percent

| Item | Designation | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period |
|---|---|---|---|
| 1. | Washed DV coal (from Komplo) | 20 | 80 |
| 2. | From Pecs | 14 | 20 |
| 3. | Soviet coal | 24 | - |
| 4. | Doubrava coal (from Czechoslovakia) | 28 | - |
| 5. | Jeremenko coal (from Czechoslovakia) | 6 | - |
| 6. | Sichta coal (from USSR) | 8 | - |
| 7. | Total: | 100 | 100 |

Table 4. Values -- mean values -- of blast-furnace coke

| Item | Designation | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period) |
|---|---|---|---|
| 1. | Moisture, percent | 3.36 | 4.05 |
| 2. | Ash content, percent (n) | 12.30 | 13.40 |
| 3. | Sulfur content, percent (n) | 1.39 | 2.10 |
| 4. | Drum strength ($M_{40}$), percent | 78.87 | 81.95 |
| 5. | Friability ($M_{10}$), percent | 6.20 | 5.49 |
| 6. | +60 mm grain size category, percent | 26.89 | 24.02 |
| 7. | Calorific value, kJ/kg | 27,749.2 | 27,299.1 |

Tables 4 and 5 show the typical characteristics (average values and scatter) of the blast-furnace coke made from the mixtures described in Table 3 during the reference and test periods. It can be seen that the metallurgical coke made from a mixture of 80 percent washed Komlo coal and 20 percent Pecs coal differed from the coke used during the reference period in the following terms:

- The moisture content increased and became less uniform as time went on. This change may be attributable to a change in coke porosity.

- The ash concentration increased by 1.1 percent, from 12.3 percent to 13.4 percent. The reason for this change is obvious: the coal mixture used to make the coke had more ash. The increase was as could be expected. The data presented in Line 2 of Table 5 indicate that the ash content was more uniform during the test period. The change also indicates that the composition of the non-domestic ingredients of the coal mixture was probably less uniform, so that a decrease in the concentration of these ingredients improved the uniformity of the batch.

- The sulfur content increased by 0.71 percent, from 1.39 percent to 2.10 percent. In this case too, the reason for the change is obvious: the domestic coals contain more sulfur than the imported coals. The uniformity of the sulfur concentration was the same during the reference period and the test period.

- The drum strength increased from 78.87 percent to 81.95 percent. There was a strength increase. The scatter of the drum strength increased, but not to a significant degree.

- The friability improved; it decreased from 6.20 percent to 5.49 percent. A decrease in crumbling indicates better physical properties; the scatter of friability increased, but not to a significant degree.

- There was some decrease in the concentration of the fraction with more than 60 mm particle size, from 26.89 percent to 24.02 percent. The change indicates a shift toward smaller grain sizes. The values showed greater scatter; the scatter increased from ±1.88 percent to ±3.94 percent.

- The calorific value decreased in line with the increased ash and moisture change of the coke. The decrease was from 27,749 kJ/kg to 27,299 kJ/kg.

Table 5. Values -- scatters (±) -- of blast-furnace coke

| Item | Designation | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period) |
|---|---|---|---|
| 1. | Moisture, percent | 0.32 | 1.06 |
| 2. | Ash content, percent (n) | 0.43 | 0.17 |
| 3. | Sulfur content, percent (n) | 0.05 | 0.05 |
| 4. | Drum strength ($M_{40}$), percent | 1.24 | 1.35 |
| 5. | Friability ($M_{10}$), percent | 0.36 | 0.49 |
| 6. | +60 mm size category of grain, percent | 1.88 | 3.94 |

Table 6. Pig-iron and slag composition (mean values)

| Item Designation | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period) |
|---|---|---|
| Pig iron | | |
| - Si content, percent | 0.92 | 0.90 |
| - Mn content, percent | 0.55 | 0.52 |
| - S content, percent | 0.048 | 0.038 |
| - P content, percent | 0.104 | 0.11 |
| Slag | | |
| - CaO content, percent | 40.43 | 42.08 |
| - MgO content, percent | 9.90 | 10.36 |
| - $SiO_2$ content, percent | 38.68 | 37.05 |
| - $Al_2O_3$ content, percent | 11.37 | 11.06 |
| - S content, percent | 1.99 | 2.44 |
| $CaO:SiO_2$ | 1.045 | 1.136 |
| $(CaO + MgO):(SiO_2 + Al_2O_3)$ | 1.006 | 1.090 |

Henceforth, the blast-furnace coke will be treated as an entity; its effect will not be examined in individual sections. The reference made earlier to a change in coke quality already reflects this approach.

## Composition of the Pig Iron and the Slag

Table 6 shows the average composition of the pig iron and tapped slag during the reference period and the test period. It can be seen clearly from the data presented in Table 6 that the quality of the pig iron was higher during the test period than during the reference period, as illustrated by the decrease in the sulfur content, in spite of the fact that the coke contained more sulfur (Line 3 in Table 3). The reason for this was that we increased the $CaO:SiO_2$ and the $(CaO + MgO):(SiO_2 + Al_2O_3)$ basicities of the slag, so that the sulfur content of the slag increased and that of the pig iron decreased. There were no significant differences in the silicon, manganese, and phosphorus content of the pig iron.

In view of the fact that the sulfur content of the pig iron was lower than during the reference period, we can also state that we have increased the basicity of the slag more than was necessary. Although the need for doing this is evident in a test, we must be objective and declare that this increased the consumption of materials and of coke specifically. If we disregard the amount of sulfur escaping with the fly dust and furnace gases, we find that the expression $So = (S)=[S]$ applies, so that $\Delta So = \{(S) + [S]\}$. During the test, the increase in the sulfur content of the system was due fully to the increase in the sulfur content of the coke; thus, the equations $\Delta S(k) = \Delta So$ and $\Delta S(k) = \Delta\{(S) + [S]\}$ applied. The data presented in Table 7 confirm this. Had we taken pig iron containing 0.048 percent sulfur — and not one containing 0.038 percent — in the test period, which would have been the amount to use with the test conditions being stable as they were, the $(CaO + MgO):(SiO_2 + Al_2O_3)$ basicity would have been 0.03 lower and the consumption of 20 kg per ton of additives for pig iron would have been reduced.

## Technological Parameters

Table 8 shows the major technological parameters for the reference period and the test period. We have already established the ore batch during the two periods and the different coke qualities used in them.

Obviously, in our test the change is the use of another coke. Based on what we know, we can already state that there was no functional relationship between the ore yield, the temperature of the blast air, and the moisture content of the blast air on the one hand, and the quality of the coke used on the other hand. However, these factors influenced coke consumption. Basically the same thing can be said about the specific gravity of the fly dust, of which the values were the same during the two periods. But there were differences in most of the parameters, and there were direct or indirect relationships among them.

Production of pig iron decreased from the level of the reference period by 6.9 percent.

This is evident from the data pertianing to the blast furnaces per day of operation (Line 1 in Table 8). In view of the fact that the intensity of coke burning decreased only by 1.3 percent (can be calculated from the data presented in Line 9 of Table 8) and the amount of mixture throughput decreased only by 0.9 percent (can be calculated from the data presented in Line 10 of Table 8), we can clearly conclude that the decrease in pig-iron output was the result of the deterioration of the batch yield (see Line 3 in Table 8), which in turn is attributable to a major increase in the specific additive consumption and to an increase in additive use since the difference between the batch (not counting the fly dust) and the additive-use change is only 1.3 kg per ton of pig iron.

As mentioned earlier, the chemical composition of the sinter was essentially constant, albeit it was less basic during the test period than during the reference period. However, it was calculated that the specific additive use increased by 6 kg per ton of pig iron even because of this minor difference. It was also mentioned in the discussion of slag composition that for reasons of safety we used higher slag basicity than was really necessary, so that -- as mentioned -- the amount of limestone used per ton of raw material increased by 20 kg per ton of pig iron.

This small decrease in batch yield was caused by a 0.31 percent decrease in the Fe content of the sinter. The reduction in pig-iron yield must be corrected (it is due to the increase in additive consumption for the 6 + 20 = 26 kg per ton of pig iron increase, and the 0.31 percent decrease in the Fe content of the sinter). The corrected decrease in pig-iron production now reflects the result of all factors resulting from the change in coke:

Table 7.

| Item | | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period) | Change |
|---|---|---|---|---|
| 1. | Sulfur content of coke, kg per ton of pig iron | 8.72 | 13.97 | + 5.25 |
| 2. | Sulfur content of pig iron, kg per ton of pig iron | 0.48 | 0.38 | - 0.10 |
| 3. | Sulfur content of slag, kg per ton of pig iron | 12.14 | 17.88 | + 5.36 |
| 4. | 2 + 3 | 12.62 | 17.88 | + 5.26 |
| 5. | (S):[S] | 26.29 | 46.05 | + 19.76 |

Table 9. Composition of the blast-furnace gas (mean values)

| Item | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period) |
|---|---|---|
| $CO_2$ content, percent | 14.63 | 14.89 |
| CO content, percent | 25.06 | 25.00 |
| H2 content, percent | 4.30 | 4.09 |
| N2 content, percent | 56.01 | 56.02 |
| $CO_2(CO_2 + CO)$ | 0.369 | 0.373 |
| Calorific value, kJ per $m^3$ | 3,623.0 | 3,589.5 |

Table 8. Technological parameters (for both blast furnaces)

| Item | Designation | 1-25 March 1981 (reference period) | 26-31 March 1981 (test period) |
|---|---|---|---|
| 1. | Pig-iron production, tons per day of operation | 1268.6/1458.9 | 1174.2/1365.2 |
| 2. | Ore yield, percent | | |
| | with fly dust | 50.82 | 50.86 |
| | without fly dust | 52.16 | 52.20 |
| 3. | Mixture yield, percent | | |
| | with fly dust | 48.72 | 45.85 |
| | without fly dust | 49.95 | 46.94 |
| 4. | Blast-air temperature, °C | 969 | 986 |
| 5. | Blast-air moisture, g/$m^3$ | 17.3 | 17.6 |
| 6. | Residual-oil consumption, kg per ton of pig iron | 60.7 | 65.3 |
| 7. | Coke consumption, kg per ton of pig iron | 627.4 | 665.3 |
| 8. | Coke firing, tons per day of operation | 784.2/927.1 | 769.6/919.9 |
| 9. | Process intensity, tons per $m^3$ per day of operation | 0.896 | 0.884 |
| 10. | Mixture throughput, tons per $m^3$ per day of operation | | |
| | with fly dust | 2.930 | 2.899 |
| | without fly dust | 2.858 | 2.831 |
| 11. | Coke loading, tons per ton | | |
| | with fly dust | 3.271 | 3.278 |
| | without fly dust | 3.191 | 3.202 |
| 12. | Specific fly dust, kg per ton of pig iron | 50.5 | 50.5 |
| 13. | Specific additive, kg per ton of pig iron | 84.8 | 214.5 |
| 15. | Specific charge (without fly dust) kg per ton of pig iron | 2001.9 | 2130.3 |

Note:
The data in Lines 1 and 8 refer to Blast Furnace I/Blast Furnace II.

$$6.9 - \{[2130.3:(2130.3-26)]-1\}.100 -$$
$$-(21\ 080 \cdot 0.31:14\ 889 \cdot 94) \cdot 100 = 5.2\%$$

where

| | | |
|---|---|---|
| 2 130.3 | denotes | the weight of the specific charge without fly dust during the test period, kg per ton of pig iron, |
| 21 080 | denotes | the amount of sinter used during the test period, tons, |
| 14 889 | denotes | the weight of pig iron produced during the test period, tons, and |
| 94 | denotes | the Fe content of the pig iron, percent. |

The specific coke consumption is the most important among the technological parameters; thus we had to examine it, the more so since we used 37.9 kg more metallurgical coke during the test period for producing a ton of pig iron. We must know the extent to which its change is justified by the change of coke. In order to obtain a true picture, we must examine the factors which affect the specific coke consumption (other than the known parameters of the metallurgical coke), and we also must know the factors which affected the change in specific coke consumption from the reference period to the test period (other than the known parameters of the metallurgical coke).

In principle, we may state clearly that the specific coke consumption increases with decreasing ore yield and blast air temperature, and decreases when these parameters increase; it increases (decreases) with an increase (decrease) with increasing (decreasing) vlast-air moisture content, Si, Mn, and P content in the pig iron, and the specific additive consumption. The change in coke consumption resulting from the change in coke quality [$\Delta k(k)$] can be corrected at an adequate degree of accuracy with the aid of the expression below:

$$\Delta k(k) = k(v) - k(b) - 10^{-2} \cdot k(b) \cdot \{-1{,}5\Delta\acute{e} - 0{,}022\Delta t(f) + 12\Delta[\mathrm{Si}] + 3{,}5\Delta[\mathrm{Mn}] + 15\Delta[\mathrm{P}]\} + 1{,}2\Delta 01 - 0{,}3\Delta \mathrm{M}_1 - 0{,}2\Delta \mathrm{M}_2$$

In this expression

| | | |
|---|---|---|
| $\Delta k(k)$ | denotes | $f\{\Delta n(k),\ S(k),\ \Delta h(k),\ \Delta M_{40},\ \Delta M_{10}\}$ |
| $k(v)$ | denotes | the specific coke consumption during the test period, kg per ton of pig iron |

| | | |
|---|---|---|
| $k(b)$ | denotes | the specific coke consumption during the reference period, kg per ton of pig iron |
| $\Delta e$ | denotes | the change in ore yield, percent |
| $\Delta t(f)$ | denotes | the change in the blast-air temperature, °C |
| $\Delta[Si]$ | denotes | the change in the Si content of the pig iron, percent |
| $\Delta[Mn]$ | denotes | the change in the Mn content of the pig iron, percent |
| $\Delta[P]$ | denptes | the change in the P content of the pig iron, percent |
| $\Delta ol$ | denotes | the change in the amount of injected oil, kg per ton of pig iron |
| $\Delta M_1$ | denotes | the change in additive consumption resulting from the higher than necessary basicity of the slag, kg per ton of pig iron |
| $\Delta M_2$ | denotes | the change in the additive consumption resulting from the higher than necessary basicity of the sinter, kg per ton of pig iron |
| $\Delta n(k)$ | denotes | the change in the moisture content of the coke, percent |
| $\Delta S(k)$ | denotes | the change in the sulfur content of the coke, percent |
| $\Delta h(k)$ | denotes | the change in the ash content of the coke, percent |
| $\Delta M_{40}$ | denotes | the change in the drum strength of the coke, percent |
| $\Delta M_{10}$ | denotes | the change in the friability of the coke, percent. |

After making the substitution with the appropriate data, we obtain the following expression:

$$\Delta k(k) = 665{,}3 - 627{,}4 - 10^{-2} \cdot 627{,}4 \cdot \{-1{,}5 \cdot \times \times(+0{,}04) - 0{,}022 \cdot (+17) + 12 \cdot (-0{,}02) + +3{,}5(-0{,}03) + 15 \cdot (+0{,}006)\} + 1{,}2 \cdot (+4{,}6) - -0{,}3 \cdot (+20) - 0{,}2(+6)$$

$$\Delta k(k) = 40{,}5 \text{ kg/t pig iron}$$

Accordingly, the value of $\Delta k(k) = f\{\Delta n(k), \Delta S(k), \Delta h(k), \Delta M_{40}, \Delta M_{10}\}$ will be 40.5 kg per ton of pig iron, compared to 37.9 kg per ton if we relate to the state defined by the data of the reference period.

In our judgment, the change of $\Delta k(k) = 40.5$ kg per ton of pig iron is very favorable and realistic if we consider the fact that as a result of the 0.69 percent increase in moisture content, 1.1 percent increase in ash content, 0.71 percent increase in sulfur content, and increases in the coke-ash and coke-sulfur content the additive consumption increased by [214.5 - 84.5 - 20 - 6 = 103.7 kg per ton of pig iron]. This result is also responsible for the fact that the yield of reducing-gas utilization did not deteriorate. This latter fact is confirmed by the changes in the $CO_2:(CO_2 + CO)$ ratio.

To sum up, we may state that the metallurgical operation carried out with metallurgical coke made from 80 percent washed Komlo coal and 20 percent Pecs coal was a unique success. This test answered the question whether the domestic cokable coal resources are suitable for the production of metallurgical coke of the proper quality. The production decrease of 5.2 percent and the 40.5 kg per ton additive consumption increase per ton of pig iron are very satisfactory results. Evidently, the metallurgical process proceeded properly, and there was practically no change in the intensity of the blast furnace, which remained essentially constant.

To conclude, we may state that the decrease in production and the increase in coke consumption during the test period -- basically undesirable effects -- could be decreased substantially (and raise our hopes for the future) by

- realizing dry coking in the new coking plant to be built;
- reducing the higher sulfur content of the coal mixture to be coked by admixture of low-sulfur, weakly coking coal;
- obtaining increased sintering capacity -- which will be the case with the new sintering plant -- to permit us to increase the basicity of the sinter and thereby to correspondingly reduce the additive consumption of the blast furnaces; and
- reducing the additive consumption by acidifying the slag and removing the increased sulfur content of the pig iron by external desulfurization.

2542
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# COKE PRODUCTION TO EXPAND AT DANUBIAN FERROUS METALLURGICAL WORKS

Budapest KOHASZAT in Hungarian Vol 114 No 12, 1981 pp 517-520

[Article by Andras Pinter, graduate metallurgical engineer, and Geza Balazsovics, graduate mechanical engineer, KOGEPTERV [Metallurgical Equipment Designing Enterprise]

[Text] Expansion of domestic coke manufacture is necessary because of the condition of the domestic energy supply and the difficulties experienced with the coke supply. Within the framework of the development program, a new, modern coking block, with a capacity of 1000 kt per year, will be built at the Danubian Ferrous Metallurgical Works. In addition, the coal-preprocessing, gas-purifying, and auxiliary facilities will also be enlarged or modernized.

The coking plant at the Danubian Ferrous Metallurgical Works is the major domestic coke-manufacturing base. The coking plant at Obuda Gas Works presently also produces; however, the production there drops continuously, and the plant is scheduled for shutdown in 1986.

Two coking blocks are operating at the Danubian Ferrous Metallurgical Works. The first was started up in 1956, and the second in 1960. They were built according to Soviet designs, and each consists of 55 chambers having a volume of 20 cubic meters.

The coke-manufacturing units are supplemented by the other required production facilities, such as the coal-receiving and -storing facilities, the unit for enrichment of the coal from Komlo, the system for making up and preprocessing the coal mixture, the unit for classifying the wet coke, the gas purification system, the byproduct-recovery facility, and the other processing systems. The coking plant also has the required supply and distribution systems and facilities.

A large part of the coke produced is used in the manufacture of pig iron. The coke with too small grain size, which is unsuitable for this purpose, is used by the general public and the fine fraction is added to the ore-preprocessing mixture.

The lifetime of a coking block is, according to international experience, approximately 25 years. If the plant is operated with care, this could be lengthened to approximately 30 years; however, in this case it will gradually deteriorate and production will decrease. After that, complete reconstruction or replacement of the used block or unit becomes necessary, according to current practice.

Considering the above and the increasing demand for coke, the State Planning Committee decided in 1974 that new coking capacity must be constructed. The new facility must have larger production and be more modern, and must have all required production, supply, and service facilities, and the existing ones must be modernized and expanded.

This investment project was delayed, primarily because of foreign-trade reasons. The investment proposal combining the technical and economic aspects was developed by KOGEPTERV, the general contractor, with a deadline of early 1981. However, the main part of the work has already been started earlier. Deliveries of the machinery and equipment have started in 1979 on the basis of a Hungarian-Soviet intergovernmental agreement concluded for the coking project, which covers the entire coking block and the dry coking apparatus associated with it, as well as part of the gas-purification plant. Local preparations for construction have started in 1980. It is expected that the new capacity will come on stream during the early part of the next five-year plan period.

Within the development project, a new coking block, having the capacity of 1000 kt per year will be built. According to present views, its capacity can be increased to 1300 kt per year by introduction of coal preheating. All other facilities are already designed to handle the increased capacity of 1300 kt per year.

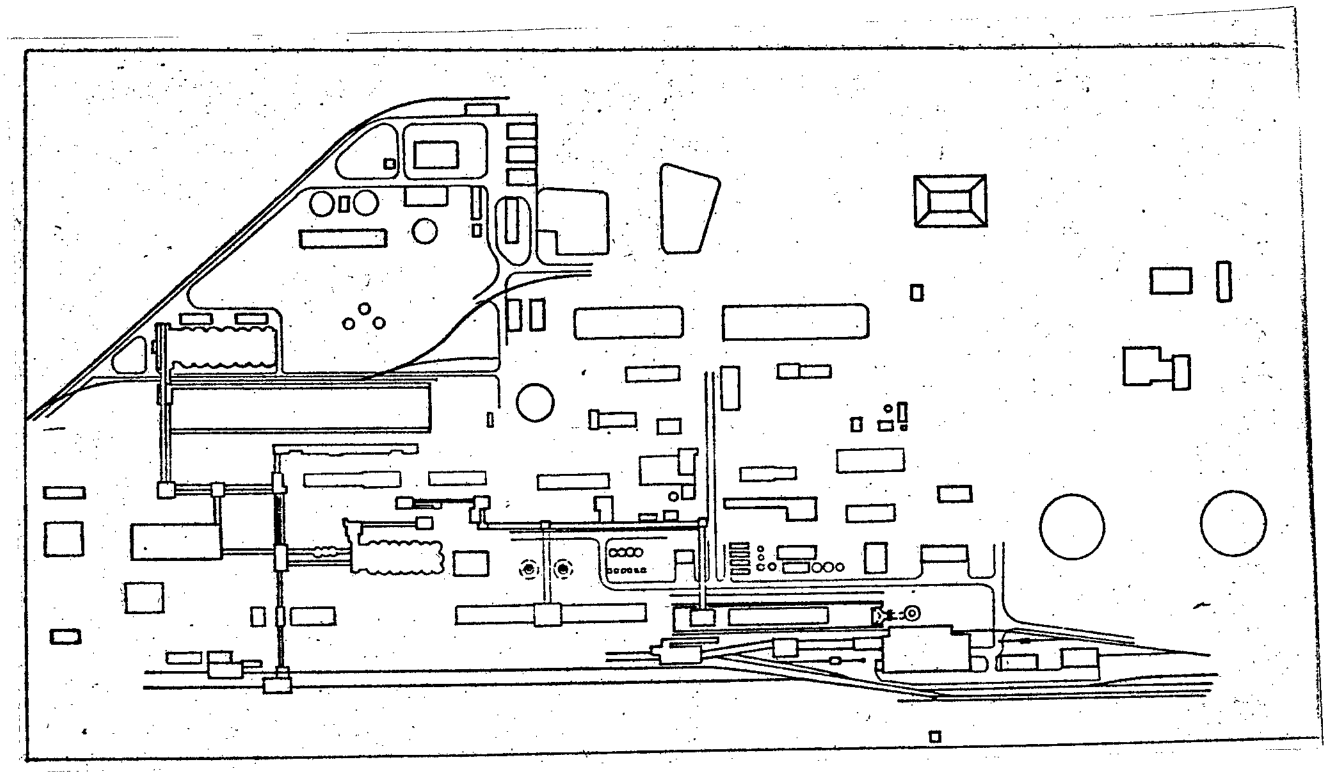

Fig. 1. Layout of the coking plant of Danubian Ferrous Metallurgical Works

Key: [Keying numbers missing in the original]

1. Freight-car dumping facility
2. Closed coal store
3. Open coal store
4. Coal-washing facility
5. Dispensing bunkers
6. Fine grinding facility
7. Existing coking blocks I and II
8. New coking Block III
9. Dry coking facility
10. Coke classifier
11. Gas condensating facility
12. Removal of hydrogen sulfide, ammonia, and benzene
13. Removal of sulfuric acid or sulfur production
14. Administrative and social facilities
15. Gas tanks

Below we describe the manufacturing process to be realized in the project and the major facilities. Figure 1 illustrates the layout of the coking plant and the major facilities.

## The Coal-Preparation Plant

A new circular dumping facility (1) empties the incoming freight cars delivering the coal. The freight cars are brought to the dumper by remotely controlled car-moving equipment, and removed from there in the same way.

The various coal types are transported from the freight car dumping facility with an enclosed conveyor belt system to 21 encolsed cylindrical closed coal stores (2) where the various coal types are stored separately. By dispensing coals of various types simultaneously from several bunkers, the coal can be homogenized and thus quality fluctuations can be avoided.

From among the coal types stored, the semiconcentrate from Komlo is transported to the coal-washing and -drying facility (4), where cokable concentrate is obtained by means of enrichment with a heavy-suspension cyclone concentrator and flotation. The byproducts go to the power plant as coal fuel.

The other coal types as well as the enriched coal from Komlo go from the closed coal store to a row of bunkers (5) via a conveyor-belt system.

The open coal store (3) remains to be available for meeting the need for additional storage during peak delivery periods. This store is somewhat smaller than the enclosed store, and is also filled from the freight car dumping facility via a conveyor-belt system.

The dispensing bunker row has 21 cylindrical bunkers made of reinforced concrete. This is where the coal mixture is prepared by metering the various coal types as required for the coking technology. Two part mixtures are prepared on the basis of the petrographic parameters. One mixture contains so-called soft or easy-to-crush coals, and the other contains so-called hard or difficult-to-crush coals. The two part mixtures are transported by a conveyor-belt system to the fine grinder (6), where different crushers are used for the different mixtures. The two part mixtures are combined to make up the final mixture in a mixer. The final mixture is transported by a conveyor belt system into the bunkers of the coal tower of the new coking block III (8). The existing blocks I and II (7)will continue to operate while the new block is started up. They use a different coal supply. If the block II remains in operation, it will continue to have facilities for supply.

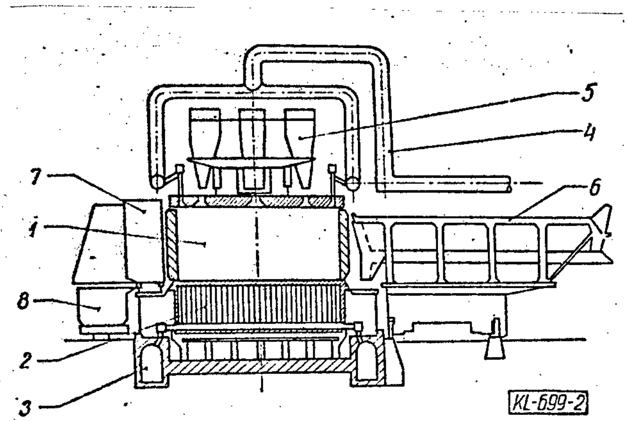


Fig. 2. Cross-sectional view of the new coking block

Key:

1. Coking chamber
2. Regenerator
3. Smoke flue
4. Gas collection system
5. Loading carriage
6. Coke sieving
7. Frontal carriage
8. Coke transport carriage

The coking Plant

The bunkers to receive the coal mixture are located in the upper part of the coal tower, made of reinforced concrete. The charging carriages are loaded with coal dispensed from these bunkers on the basis of precise metering. The electrical switching center, the instruments of the measuring and control equipment, the firing switch, and the other facilties required for the process are accommodated in the lower part of the coal tower.

The coking block (Fig. 2) is a modern, large, bottom-fired unit, having 65 chambers (1), each with a useful volume of 41.6 $m^3$. Chamber volume is regarded as an important measure of the modernity, and the current value for new blocks is 40-50 $m^3$. Cahmber gas is used to heat the chambers. The air required for the combustion is preheated in regenerators accommodated under the chambers (2). There are 32 heating ducts in the heating walls between the chambers. The planned chamber turnover is 14 hours. The flue gas generated goes to the chimney via the smoke ducts (3).

The leveling bar of the coke ejector (6) levels the coal loaded into the chambers by the loading carriage (5). After degasification, the incandescent coke goes to the front carriage (7), pushed there by the ejector head of the coke ejector, and thence to the containers of the coke carriage. This carriage transports the incandescent coke to the dry coking facility.

In addition to their main task, the furnace machines perform many other functions. The loading carriage automatically opens and closes the dispensing units of the bunkers of the coal tower, and cleans the rise pipes serving for the discharge of the chamber gas. The coke-ejector machine and the front carriage remove and reinstall the chamber doors, clean the doors and door frames, regulate the loading of the anchor bolts, and so forth.

The coke-ejector machine, the front carriage, and the coke carriage remain monoaxial while the incandescent coke is pushed out. This is ensured by a high-frequency gating system. The coke cannot pushed in the wrong direction.

The raw chamber gas developing in the course of coking goes to the gas purification and byproduct plant via the gas-collector unit (4).

The data required for controlling the operation of the coking block (the temperature, the pressure, the draft, and so forth) are displayed and recorded in centralized instruments. The control is largely automated.

Once the incandescent coke has been pushed out, it goes into the dry cooling unit developed in the Soviet Union (see 9 in Fig. 1). There, nitrogen gas flows through the coke, cooling it to approximately 180-260°C. The heat in the gas is utilized in the smoke-gas boilers, where steam at a pressure of 40 bar is generated.

The advantage of dry cooling in metallurgical operations is that the properties of the coke processed in this manner are better, the coke is stronger, has a better particle-size distribution, and is practically free of moisture. In addition, the waste heat, is utilized, and -- since the cooling is in a closed space -- the environment is not polluted.

## The Coke-Classification Plant

The coke coming from the dry cooling unit first goes to a dust-removal system, where the coke dust is separated by vacuum.

The coke, which is practically free of dust, is classified into grain-size fractions with roller-equipped vibrating sieves. The 25-18 mm coke fraction is used in the manufacture of pig iron, the so-called walnut-size fraction of grain size 10-25 mm, is sold to the general public, and the 0-10 mm fraction is used for ore preprocessing. The amount of metallurgical coke required at Danubian Ferrous Metallurgical Works goes into the bunkers there via conveyor belt. The excess coke of all fractions is loaded into freight cars and shipped away.

## The Gas-Purification and Byproduct Plant

To eliminate harmful effects in use (firing), the chamber gas generated in coking must be purified. The substances removed in the course of purification are processed to obtain byproducts for use within the Ferrous Metallurgical Plant or for sale in domestic and foreign markets.

First, the tar is removed from the raw chamber gas. This is accomplished by washing, cooling with transverse-tube coolers, and electrostatic filtration within the gas-collector pipes. The tar thus obtained is processed in the tar-distillation unit. This gas-condensing plant (11) also includes the pressure-increasing exhaustor.

The next stage is the removal of hydrogen sulfide and ammonia (12) by means of various chemical and physical methods in combination. The ammonia is used for the manufacture of ammonium sulfate. The hydrogen sulfide is transported away for further processing.

After removal of the ammonia, the raw benzene is removed by oil-washing. The product is transferred to the benzene-processing plant.

The purified chamber gas goes into the gas reservoir (15) and thence to the ultimate consumer.

There are two possible ways for the utilization of the hydrogen sulfide gas. In the investment proposal, manufacture of sulfuric acid at a concentration of at least 92 percent is considered (13). Studies are in progress to evaluate whether the manufacture of sulfur would not be more desirable. Bids are presently solicited for the required equipment. The sulfur could be used in agriculture, in the rubber industry, and also for the manufacture of high-purity sulfuric acid. If the studies indicate that the approach is economical, it will be used; if the manufacture of sulfuric acid by the catalysis method is more economical, this will be implemented.

A new administrative and social center (14) is built next to the gas purification and byproduct plant.

In addition to ensuring that modern technological methods and equipment are used, care has to be exercised to ensure that contemporary methods of control and management are used, and that due attention is given to the protection of the environment.

The data of the measuring and control instruments are fed to a central control station, where they are displayed and in part recorded. Based on these data, the equipment is operated via remote control from the station.

Within the framework of the pollution-control measures, the equipment where dust and gas is emitted will have exhaust devices and precipitators. Purification of the industrial wastewaters will be accomplished in a new biological wastewater purification system. The water will meet the applicable purity standards when it is discharged.

The following amounts of coke, chamber gas, and byproducts will be produced yearly in the new coking block:

| | |
|---|---|
| Metallurgical coke | 885,000 tons |
| Walnut-size coke | 45,000 tons |
| Small-grain coke | 70,000 tons |
| Purified chamber gas | 219,500 standard cubic meters |
| Tar products | 40,165 tons |
| Ammonium sulfate | 13,400 tons |
| Benzene and its homologs | 9,700 tons |

In addition to the above, the products will include sulfuric acid or high-purity sulfur -- depending on the method selected for processing the hydrogen sulfide -- and steam (in case the dry coking method is used).

If the coal supply of the presently operating coking block II can be ensured, the coke production could become 1,300,000 tons per year, and the amounts tabulated above could be increased by 30 percent.

The planned investment project considerably facilitates the coke supply of the metallurgical industry. Hungary will have a modern coke factory operating at a high level of technological sophistication.

2542
CSO: 2502

DIRECTOR OF LABOR MIM DISCUSSES OL-630

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 4

[Interview with Mihaly Modi, director of the Labor MIM [Labor Instrument Industry Works]: "A Real Profile Change"]

[Excerpts] [Question] How did the new profile come to the enterprise? When did development of the semiconductor store [OL-630] begin and who initiated manufacture? Did production start in response to orders, as a result of a market survey of on factory initiative?

[Answer] When starting such themes the initiative always comes from market demand. In addition there was an external and internal intellectual capacity capable of digesting such market demands. It also contributed to success that this intellectual base knew the computers recently installed in Hungary and had profound knowledge of computer technology. I would like to note that there was a very strong computer technology development program in the old Ministry of Heavy Industry and the leaders and executors of this program acquired the hardware and software expertise which made possible the development of the semiconductor stores. The enterprise showed suitable sensitivity to this and carried out a vigorous development, knowing the real market needs. Not quite 2 years elapsed from the first idea to installation of the first product. I believe this is a rather short time, because in 2 years we had to develop a manufacturing base--with all the objective and personnel conditions --which could satisfy not only the market demand then but also the demand to be expected.

[Question] What sort of difficulties did the alien profile cause in the factory and how does it look now according to judgment inside the factory?

[Answer] The difficulties of introducing the product did not exceed the difficulties of introducing our classical products. A slight change in attitude was needed in the enterprise and in manufacture also. Parallel with this theme could not be developed or manufactured in the old ways. So, within the relatively rigid enterprise organization, we created possibilities which deviate from the customary.

[Question] What sort of possibilities? What is the planned annual manufacturing volume between 1981 and 1985? With what sort of delivery time limits do you accept orders?

[Answer] I have said already that we created a manufacturing capacity aimed at the needs of the future. At present we can satisfy every market need over a relatively broad scale, in general within 6 months of the orders. The planned annual manufacturing volume was 40 million forints in 1980; we approached 100 million in 1981; and we plan 150 million for 1982, which is existing orders. If the enterprise should get more orders then we can increase capacity to about 200 or 300 million forints.

[Question] The next question relates to this also. What is the manpower situation--with special regard to training and numbers?

[Answer] We adjusted our personnel development to the project. The situation is favorable, because this program is attractive to electronics experts, so we can hire 10-15 college or university graduates for this area each year. The expansion of volume will always determine hiring and preparations for the future. I can say with assurance that the personnel conditions are more favorable than many other conditions, because the Hungarian supply of electronic basic materials is just now developing.

[Question] Parts supply is the basis for manufacture. Do you feel it advantageous that so large a factory should get what it needs from a stockpiling enterprise?

[Answer] I believe that the acquisition and stockpiling enterprise, ELEKTROMODUL, understands what national economic significance this product has and thus far the supply of parts has been assured without a hitch. This is a great advantage. Hopefully we will have no problem in the future either.

[Question] What further ideas do you have in regard to supplementing the new ESZR [Uniform Computer Technology System] and MSZR [Minicomputer System] models?

[Answer] Memory expansion ideas for the ESZR and MSZR models have been developed and we have carried out developmental programs. Briefly I can say that we can provide stores for every type of ESZR computer in the country. Our achievements in connection with the ESZ 1020 and ESZ 1022 are well known. This year we will complete developmnnt of a store which can be attached to the ESZ 1035, but we are already dealing with memory expansion for the ESZ 1055. The ESZ 1060 machines will appear soon, and we would like to expand them also.

[Question] Do you have ESZ 1040 developments also?

[Answer] Yes. Considering that this is not a Soviet but a GDR system there are a number of problems. If we get enough orders then, naturally, we will make adaptors for these machines also.

[Question] And what about the MSZR types?

[Answer] Memory expansion for the SZM-4 has been solved. The first store--which we entended for a "torture test"--has been operating without trouble for

a couple of months. I see no obstacle, if an enterprise importing and selling MSZR types indicates a need we can satisfy it in the future.

[Question] What sort of contacts are there with developers and users?

[Answer] Our contacts with the developers are extraordinarily favorable. There are very many components to this. In addition to various friendly contacts we have discovered a common interest also. With maximal exploitation of our present possibilities we built up an interest system in which the moral and material interest of developer and manufacturer are common.

On the basis of experience contact with users is very favorable; the users measure the time needed to install memory expansion in minutes and thus far there has been no indication that any of our installed stores caused trouble to the work of the users.

[Question] This reference to minutes prompts a question. Have you really ever installed a semiconductor store in 10 minutes?

[Answer] Unpacking takes longer than installation, but since installation includes unpacking the answer is no.

[Question] Do you plan deliveries abroad?

[Answer] In regard to foreign deliveries, our discussions are aimed at ad hoc memory expansion for ESZR and MSZR machines; if we can harmonize the conditions with national economic interests such deliveries may take place in the future.

[Question] Which enterprise handles domestic sales? What sort of cooperation do you have?

[Answer] Domestic sales are handled by the SZAMALK [Computer Technology Applications Enterprise], as the responsible enterprise. We signed a civil law cooperation contract with the OSZV [National Computer Technology Enterprise] (the SZAMALK is its legal successor) a year and a half ago and the contract sets forth unambiguously the tasks of manufacturer, installer and maintenance. This is a living contract, always adjusted to life. Our cooperation is extraordinarily good. I believe that there is a meeting of interests in this, and an outstanding role is played by a vigorously developing national economic interest.

[Question] Does this mean that the Labor MIM has no direct contact with the user but always goes through the SZAMALK?

[Answer] Both really, because as manufacturer we do not want to be separated from the users; it is crucial to our future developments that there be a link between user and manufacturer. In the interest of this we are making efforts beyond what is contained in the contract, which involve significant material expenditure. In the future we would like to expand these contacts too.

[Question] Kowing the new product, how would you define the developmental profile of the enterprise?

[Answer] It is not only the technology and function of the new product which have an effect on the enterprise developmental program, the new attitude does also. Concrete signs of this attitudinal effect are appearing also. I would mention as an example the large capacity autoclave control, which we started in the new spirit. We based the control not on 30 relays but rather on a microprocessor. This product has resulted in a generational change in terms of modernness and cost of production.

[Question] And what is the situation in regard to quality?

[Answer] This is a special product and it requires special quality. Design, manufacture and the enterprise organs responsible for quality had to adjust to this and we had to use a system which guarantees that quality always corresponds to the planned norms.

[Question] How do you see the domestic future of the products manufactured?

[Answer] Our goal is to take measures at the drawing board which will result in greater quality improvement and reliability so that the product coming off the drawing board should guarantee the reliability of a very valuable system. When starting this program the enterprise had two goals in addition to the internal enterprise goals. One was that this program be compatible with the developmental program for Hungarian electronics. The other was the realization of an ad hoc development, manufacture and adaptation project. In my opinion this supports the developmental program for domestic electronics and fills those gaps which the large enterprises dealing with the production of electronics products cannot satisfy and do not even want to satisfy at this production volume.

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we tested elimination of the OVERLAY structures and as a result of these tests, and taking into consideration the technical reliability, we decided to acquire the semiconductor memory."

(There were no answers from two of the users.)

"How much time elapsed between order and delivery?"

It appeared from the answers that this time ranged from 2 to 6 months, with an overage of 4 months.

"How long did it take to put it into operation?"

The average was 5 hours for five users.

"Putting the first 512 K bytes of memory into operation took 2 hours, the second took 6 hours."

"Putting it into operation took two shifts, because our machine had a problem --for other reasons."

"When was it put into operation and how many faults have you noted in the units since then?"

"December 1980. There were a few insignificant faults in the first days, since then none."

"There has been one failure since it was put into operation in February 1981, a power unit contact defect; we cleared it up during maintenance."

"It has been working faultlessly since February 1981."

"February 1981; it is working well."

"There have been three failures since March 1981."

"It was put into operation in August 1981. A failure appeared on one occasion since then, and it was cleared up very quickly by experts arriving on the scene. The source of the failure was a switch with a manufacturing defect."

"What changes in your processing were brought by putting the memory expansion into operation? Did the conditions for programming or operation change?"

"We can run more extensive programs."

"System development and programming operations connected with the switch to OS were accelerated."

"The greater storage capacity facilitates programming work since the upper limit of 128 K bytes is no longer a limiting factor."

EVALUATION OF OL-630 STORE

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 5

[Article by Kalman Nandori and Ferenc Zilahy: "A Status Report From the Users of the Semiconductor Store"]

[Text] Since December 1980 the OL-630 operating store made by the Labor MIM [Labor Instrument Industry Works] has been placed into operation at nine enterprises. We asked a few users with operational experience what experiences they had in the course of acquisition and use.

In what follows we publish excerpts from the questions of those conducting the survey and from the answers of the users. We chose this unusual form of publication to give those interested in acquiring the store most direct access to the opinions of the users.

--the editors

"After studying what references did you decide to acquire the semiconductor memory?"

"We looked at the prototype in operation at the NIM IGUSZI [Ministry of Heavy Industry Institute of Industrial Economics and Systems Analysis]."

"We consulted on a number of occasions with the experts at the NIM IGUSZI and as a result of these discussions we ordered the store from the OSZV [National Computer Technology Enterprise] (the SZAMALK [Computer Technology Applications Enterprise] is its legal successor)."

"We decided on the basis of personal talks with the designers of the OL-630."

"We decided on acquisition on the basis of practical experience in the NIM IGUSZI computer center."

"In our computer center we developed an information system based on a DBOMP data base management system. The programs and program systems have a long running time and are so extensive that they could be prepared only in an OVERLAY structure. Using the 1 M byte operating store of the NIM IGUSZI

"The level of operations improved substantially; processing backlogs have decreased as a result of multi-ing."

"The ratio of multiprogramming increased significantly."

"The sizes of the programs have not changed but now they run reliably. The original ferrite memory was no reliable; there was an average of one or two failures daily."

"We can run the extensive programs in less than half the time. In the case of less extensive programs we make effective use of the advantages of multiprogramming. These two factors resulted in freeing 20 percent of the effective machine time, which we use for program development."

"Are you working with the same or a different operating system? Are you using operational modes or program products not used prior to memory expansion?"

"The operating system is unchanged; processing is substantially more efficient because of the possibility of multiprogramming."

"With memory expansion it becomes possible to introduce such modern systems or programs as, for example, OS and ISMS."

"We supplemented the DOS operating system with the possibility of POWER spooling."

"We still use the former DOS operating system, but since the expansion we regularly run under OS also. We are using the IDMS data base management system and have introduced use of TSO."

"At present we are working under DOS and we are using the IDMS/DOS system. We plan to introduce OS and operation under IDMS OS."

(Answers were not received from two users.)

"Do you plan to develop the remote data processing possibilities?"

"No."

"Yes."

"We plan technical realization of remote processing in this 5-year plan with the introduction of a multiplexor ond terminals."

"We will begin to develop a remote data processing system in the near future."

"There is no decision as yet."

"We are planning remote processing work in 1982-1983; a reliable store of 512 K bytes is indispensable for this. For this reason expansion of the 256 semiconductor store figures in our plans."

"We are planning adaptation of the CICS."

"In your opinion, can introduction of the semiconductor store extend the operational life of your ESZ 1022 computer? If so, by how much? If not, what efficiency increase are you counting on?"

"Utilization of the computer is substantially greater; we want to expand memory up to 1 M byte."

"Our operational experiences thus far (breakdown statistics, etc.) show that operational is determined not by the central unit but rather by the life expectancy of the peripherals. The latter, unfortunately, does not even reach the 7 year amortization time now used; they (for example, the typewriter) can be operated after even 3 years only with basic renovation. In our institute the exchange of memory resulted primarily in a reliable unit. With the exchange one can estimate the operational life of the CPU at about 8-10 years."

"Yes, but the supply of peripherals has a determining role."

"Indirectly yes; but putting the semiconductor store into operation results in eliminating the 15-20 percent system downtime due to machine fault."

"Efficiency increases because the downtime due to store fault is virtually zero."

"We have experienced a substantial increase in efficiency; the possibliity of multiprogramming increased. The memory expansion unit is a highly reliable, good design, uses little power, can be services well and is a well serviced system element."

"According to our experience the weakest point of the ESZ 1022 computer was the ferrite store. With use of the semiconductor store, in our opinion, the operational life can be extended physically by about 4-5 years. At the same time the moral depreciation limit may be shifted significantly also, because the operational memory of the machines can be expanded to 1 M bytes and it becomes possible to run program systems which otherwise could be run only with a larger machine, or virtual machine. According to our estimate the time limit for machine exchange due to moral depreciation can be extended 2-3 years."

"Now that you have operational experience as well, to what extend are you satisfied with your decision resulting in the expansion, are you satisfied with the store provided by the Labor MIM?"

The users were unanimously satisfied:

"In connection with the store exchange and putting it into operation, we feel that we got a product at the level to be expected in computer technology."

We received answers from workers at UTORG, Zalaszam, the OTAF, VOLAN, KOGEPTERV [The Metallurgical Machinery Design Bureau], EDASZ [Electric Power Service Enterprise of Northern Transdanubia] (Gyor) and the OKISZ [National Federation of Artisan Cooperatives].

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SPECIFICATIONS OF OL-630

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 5

[Article by Zaltan Emodi: "Store Characteristics"]

[Text] One obstacle to more efficient utilization of the ESZ 1012 computers--which make up a significant part of the domestic ESZR [Uniform Computer Technology System] machine park--has been the relatively small capacity of the operational store. In general the installed machines were operated with a store of 256 K bytes, in some cases only 128 K bytes.

Because of the long delivery times and high price (at the end of 1978 the price of a 256 K byte ferrite unit was over 10 million forints) few undertook memory expansion. But even then the central unit could accept a store with a capacity of only 512 K bytes.

Because of this, and recognizing the possibilities, the technical department of the NIM IGUSZI [Ministry of Heavy Industry Institute of Industrial Economics and Systems Analysis] developed a modern, semiconductor store and modified the address domain of the central unit thus making it possible to expand the use of operational storage to 1 M bytes. Seeing the significance of the developmental achievement the Labor Instrument Industry Works (Labor MIM) began manufacture of the new stores. The new semiconductor stores are made in a cabinet a good bit smaller than the original and each cabinet can have a maximum capacity of 512 K bytes.

The more important technical data of the OL 630 semiconductor memory of the Labor MIM are: multiplex store, 16 K bytes; protection key store, 256x6 bits; cycle time, 2 seconds; access time, 800 microseconds; access time for protection key store, 80 nanoseconds; power supply, 200 volts plus or minus 10 percent, 50 cycles per second; power used, 350 watts; cabinet size, 1,100 x 586 x 586 mm; and weight, about 75 kg.

The OL 630 store is compatible at the connector level with the ESZ 3222 ferrite store of Soviet manufacture. The semiconductor design would make possible much faster operation than that specified but the ESZ 2422 central unit cannot use this.

In its operating and multiplex store the storage unit uses 4 K bit capacity static MOS elements. At the time of its design there were already 16 K bit

capacity dynamic semiconductor stores, but use of smaller capacity, static elements seemed best as they were striving for simplicity of design and especially for greater reliability.

In the interest of reliable operation of the device the integrated circuits built into it are tested before they are built in and after soldering up. Several special purpose microprocessor instruments were made for testing. Especially time-consuming is the test which studies "cross talk" between individual storage cells within a casing, in the case of differnet bit samples.

Before connection to a computer the finished, assembled devices are tested on an off-line tester and are connected to an ESZ 1022 computer only after 24 hours of continuous operation.

Faults appearing in initial operation after installation cause much inconvenience for users so prior to shipment every store gets test operation on an ESZ 1022. The "burning in" is done by experts of the SZAMALK [Computer Technology Applications Enterprise] on an ESZ 1022 computer, for a minimum of 80 hours per unit. According to experience thus far this is enough.

Operating experiences during the first year were very favorable; failures were very rare and in general they could be eliminated by local experts in 15-20 minutes. The readable, easy to manage documentation and the adequate supply of spare parts offer great help in this. Equipment has never stopped anywhere due to a shortage of parts.

There was only one serious problem in the course of initial manufacture--the connectors for the printed panels came from two different manufacturing series, one of which was faulty and easily split lengthwise.

The manufacturer will immediately replace store frames equipped with faulty connectors for sound ones as part of the guarantee.

The users are very satisfied with the equipment delivered thus far and SZAMALK offers service exceeding the domestic average.

With its greater reliability, lower price (about 4 million forints) and shorter delivery times the OL 630 store has become the leader for domestic ESZ 1022 machines. Recognition is due to the OSZV [National Computer Technology Enterprise] (SZAMALK is its legal successor) for quickly undertaking, in the absence of references, and helping to supply domestic users of the ESZ 1022 with cheaper, more modern equipmnnt.

On the basis of the experience gained the Labor MIM had developed and is manufacturing a semiconductor store for the ESZ 1020 and a version compatible with the SZM-4.

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USES OF THE OL-630

Budapest SZAMITASTECHNIKA in Hungarian Jan 82 p 6

[Text] The ESZ 1022 computer of Soviet or Bulgarian manufacture makes up nearly 50 percent of the larger ESZR [Uniform Computer Technology System] machines, the homogeneous machine type which defines domestic computer technology resources. This model--on the basis of its technical parameters--can be classified among the small-medium computers; its ferrite store can be expanded to 512 K bytes; the maximum capacity of the magnetic disc background store which can be connected to the system is 29 M bytes per drive unit. On the basis of these two parameters it can be established that the system is suitable for local processing in the batch mode and for the development of a data base management system of limited size.

Increasing the capacity of the system--it being so widespread--would significantly influence the efficiency of domestic computer technology applications.

There are two ways to increase its capacity--by increasing the reliability of the system and by expanding its resources.

Reliability--primarily in the case of I/O devices--can be increased by increasing reserves. In the case of the functional elements of the central unit, however, this solution is difficult to apply in an economical manner. On the basis of service experience, more than half of the central unit problems can be traced to faults with the operational store.

Naturally, expanding the resources of the system can be realized only with certain limitations. One can increase the number, variety and capacity of I/O devices participating in processing, but at the level of use one cannot change the average time for the execution of instructions.

One possible way to increase resources is to increase the capacity of the operational store. Of the 46 ESZ 1022 systems delivered to Hungary only 16 had the maximum ferrite store permitted to the model (a capacity of 512 K bytes). At the same time, the remote data processing applications which will spread in the first half of the 1980's will make demands on the central unit exceeding 512 K bytes.

Increasing reliability and the available resources make it necessary to increase the operational store of the ESZ 1022 systems. Since stores can be

acquired from the countries manufacturing the system only at a relatively high price and after a long wait we are using the domestically developed OL-630 semiconductor store to increase operational storage. The OL-630 can be connected to the ESZ 1022 computer without modifying the receiving electronics, making possible the development of mixed (ferrite and semiconductor) systems. With a minimum modification of the central unit the OL-630 makes possible the construction of a machine with 1 M bytes of operational storage.

What advantages accompany use of the OL-630 in ESZ 1022 computer systems?

--The 1 M byte operational storage capacity makes possible the development of more efficient remote processing and data base querying and actualizing systems, and thus the creation of information systems, in addition to local processing.

--The greater reliability of the OL-630 increases the reliability of the entire system and with suitable design makes it possible to create reserves even in the case of the operational store.

--The semiconductor store is less sensitive to the introduction of circuits and to environmental, primarily temperature, changes; there is less need for maintenance and the number of errors, which hinder continual operation, are fewer.

--If the storage module should fail repairs can be made by a card change, essentially without stopping the system. Changing a faulty storage element can be done in a fraction of the time needed to repair a ferrite store (for example, core breakage of fiber parting).

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## BRIEFS

TOXIC WASTE DISPOSAL CENTERS--The Institute for Environmental Protection has announced a plan for setting up facilities for treating and disposing of toxic wastes. Hungarian industry generates annually a total of 300,000 tons of waste toxic to humans, animals and vegetation. The Institute proposes to set up five facilities for dealing with it by 1995. They are to be located in Budapest, Papa, Pecs, Hodmezovasarhely and Leninvaros and will include laboratories, incinerators and dumps. The estimated cost of the network is 3.2 billion forints. [Budapest MAGYAR NEMZET in Hungarian 1 Apr 82 p 3]

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# COMPUTER DEVELOPMENT, APPLICATION DESCRIBED

## Demand for MERA-60 Minicomputer

Katowice TRYBUNA ROBOTNICZA in Polish 17 Feb 82 pp 1, 6

[Text] A few days ago, a delegation returned from the Soviet Union composed of employees of the Scientific-Production Center of "MERA-STER" Control Systems in Katowice and from the Foreign Trade Agency "Metromex" in Warsaw. As we were informed in Moscow, one of the biggest trade transactions in the history of Polish automation was signed.

The agreement entered into with the Soviet trade center "Techsnabexport", which represente the interests of the Academy of Science and of scientific institutions of the Soviet Union in international contacts, amounts to the additional delivery, this year yet, of 174 "MERA-60" computer systems with a cumulative value of 700 million zlotys. This places the manufacturer of the minicomputer, the "MERA-STER" Center in Katowice in the order of the largest domestic exporter of computer control systems. In the course of discussions, a preliminary agreement was also signed for further deliveries of the "MERA-60" computer during the years 1983-1985. In approximate terms, the deliveries will reach about 4.5 billion zlotys.

Owing to this contract, the control system "MERA-60" is becoming the basic minicomputer with which Soviet scientific institutes are being equipped--both Academy of Science institutes as well as industrial institutes.

What was it that decided about such a great success of "MERA-60"?

"Two years ago", states the director of the Scientific-Production Center of MERA-STER Control Systems, Dr (Habilitatus, engineer) Ryszard Pregiel, "we delibered the "MERA-60" minicomputer to the Institute of Nuclear Research in Dubno. It is the evaluation of this institution, following a 2-year period of operation of our equipment, that contributed to the undertaking of the decision about introducing it for operation in a majority of scientific institutes of the Soviet Union. Three factors constitute the basis for success: computer softward which gives it priority in the class of computer systems manufactured in socialist countries; a high rate of reliability in connection with the transition from a ferrite base to a base of semiconductors using the highest quality of elements available in socialist countries, mainly in the Soviet Union and the fact that the system is based on modules which have already earlier achieved a standard status in Soviet laboratories.

Development of RYAD System

Gdansk GLOS WYBRZEZA in Polish 23 Feb 82 p 3

[Text] The future of computer systems in Poland will be linked, to a large extent, to the development of the "RYAD" uniform system of EMC [electronic digital computers] both in terms of production as well as in terms of its application. This arises not only from settlements within the framework of CEMA but from economic circumstances. Poland has been participating in the "RYAD" program from the moment of its inception.

Member countries of CEMA took up cooperative action in the area of scientific elaboration, production and use of computer equipment 12 years ago. The agreement of cooperation was signec by the following countries in December 1969 : Bulgaria, Czechoslovakia, GDR, Poland, Hungary and the USSR. These countries were later joined by Romania and Cuba. A program of cooperation was mutually worked out whose goal was to create a "RYAD" Uniform System of Electronic Digital Computers [JS EMC]. The joint activity is directed by an international commission whose organs are, among others, the Council of Chief Designers, the Working Group for matters relating to the Automation of Control Systems and the Coordinating Center.

What part does Poland play in this joint activity?--Poland manufactures both central units (computers) as well as peripheral equipment. The series production of the R-32 computer was undertaken in the Wroclaw plants of Mera-Elwro in 1975. The peripheral equipment manufacturing industry has developed to a significant degree. The Mera-Blonie plants have become one of the largest manufacturers of this type of equipment. It [the equipment] is produced predominantly for export. The sale of information science equipment was in the past 10-year period, the most profitable export of the electro-machine industry. The elaboration of domestic research facilities and purchased licenses enabled the production of modern equipment : mosaic printers, computer display monitors, floppy-disk memories, microcomputer systems for controlling machine tools and machining centers. The post-license development of these manufactured products may, in the upcoming years, make possible the production of modern printers controlled by microprocessors, a new family of computer display monitors, floppy-disks with double density and specialized terminals controlled by microprocessors.

The achievements of the Polish computer industry--regardless of the state of information science in our country, whose application is still quite far removed from the needs and possibilities--were, among others, the creation of a considerable manufacutring potential in the Mera-Elwro plants; the elaboration and production of ferrite operating memories for the Uniform System and Minicomputer System of Electronic Digital Computers and the elaboration and production of Mera-60 and Mera-400 minicomputers. In addition, many systems were elaborated, among others, a data base for uniform system computers and the production of the already mentioned printers, memories, etc., was also undertaken.

In the development of the computer industry, it was rational to assume that a country such as Poland cannot take on the production of the full assortment of equipment needed by information science. For this reason, a special line of production and the replacement of instalation within the framework of CEMA is beneficial. The special line [of production] allows for the extension of the production series and for the lowering of hardware production costs.

Polish specialists are engaged in work on a third series of "RYAD" Uniform System computers; they work jointly on software equipment; they are the designers of systems which, among other things, aid design and scientific work.

For the future of computer industries in socialist countries including Poland and for the development of electronics and information science, in general, new undertakings are also of great significance, aside from cooperation within the framework of the "RYAD" Uniform System of Electronic Digital Computers. During the 35th CEMA session, which was held in Sofia in July 1981, among others, an agreement was made in regard to cooperation in the area of creating a uniform base of electronic computer products.

## Computerized Steel Production Line

RZESZOW NOWINY in Polish 26-28 Feb 82 p 1

[Text] (Own information)

The production potential of the "Stalowa Wola" Steelworks [HSW] is being expanded by a, so-called, FZ-200 computer system. This is the first in Poland and the largest produced by the GDR industry, automated line of production of gear wheels with a projected capacity of 320 thousand wheels per year. Give computers will control the work of 60 machine tools, manipulators and that of the entire system.

"At the present time, activating work is being concentrated on the technical placing into operation of particular technological units", informs the director of the FZ-200 system in HSW, engineer Ryszard Dul. "We have already placed 40 single technological units in operation. The system of computer control is being set in motion."

How many specialists from GDR are currently working on setting this computer production line in motion? How is cooperation with them working out?

"At HSW there is a group of over 40 professionals from GDR", continues eingineer R. Dul. "There is still a lot of work remaining for the duration of several weeks. The progress of this final work is being coordinated by the director of the computer systems of the Berlin plants "7 Oktober", engineer Dieter Rietzel. I will add that this is the third line of this type produced by GDR factories while the first two, considerably smaller ones, are in GDR and in Czechoslovakia. As far as cooperation with the specialists from GDR is concerned, everything is going well. This does not mean thatin certain technical matters, we do not have, at times, differences of opinion which, in effect, however, contribute to the successful solution of production problems.

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